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THE ELECTRICAL REVIEW

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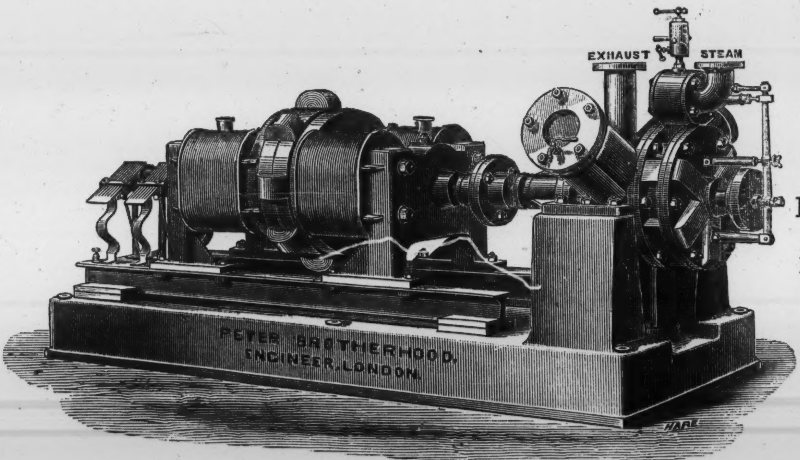

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THE TELEGRAPHIC JOURNAL AND

Electrical Review.

VOL. X.—No. 240.

THE PROSPECTS OF ELECTRIC LIGHTING DURING WINTER.

IT might be expected that owing to the recent extraordinary development of electric light companies the forthcoming winter will show an enormous amount of activity in installations of the electric light compared with that of last. The activity may be there, but whether the necessary work can be performed as fast as the demands for the new illuminant are received is by no means so sure. Ever since the electric light became sufficiently practically advanced to be depended upon for the purposes of public or private illumination, the orders given have been far in excess of the machines and lamps turned out. As far as we can judge, it appears pretty certain that the great bulk of whatever business may be done when the dark days come upon us, will fall into the hands of the few companies upon whom the work of last year devolved. Within the next two months—very little time in which to organise a system and staff capable of giving every satisfaction to the consumers of the electric light—the new companies of the present year ought to be in readiness to execute any work which may fall to their share. Can this be done? We must confess that we have very grave doubts as to the successful working of most of the companies recently brought forth, for it seems to us that that organisation which ought to have been completed in the summer is not even commenced, and that the ensuing winter will be more a season of experiment than of actual and profitable business to most of the companies concerned. We may take it for granted that the demands for the electric light will shortly be far greater in proportion to what has gone before than its most sanguine supporters imagine, and there is no time to be lost in endeavouring to meet this demand. But where out of all the companies now existing shall we find a factory containing a number of machines [illegible]ps ready for service, if we except those of Brush and [illegible]oots, Siemens Brothers, the British Electric, and the Electric Light and Power Generator Company. We well remember assisting at the experiments of a well-known [illegible] semi-incandescent" lighting as long ago as 1878, and *bonâ fide* orders for this light poured upon the [illegible]tatives of the system in shoals, but none of the apparatus necessary for sending away was at hand; and, in this instance, that which promised an enormous business ended in the usual way.

There is no reason, however, why many of the newcomers should not enter the lists, and compete on favourable terms with those already established, if they do not allow the grass to grow under their feet at the present moment. By September, at the latest, electric light companies seriously intending to do business, should be in possession of electric machines and lamps, in large numbers, and a competent staff should be at hand to be sent out in all directions, if necessary. It is to be hoped that the failures of last year—most of them resulting from the incapacity of those employed to direct the work—will now be reduced to a minimum. The experience gained experimentally during the past six months from the Electrical Exhibition at the Crystal Palace alone, should surely be of great assistance in the arranging of permanent installations; at any rate, those supplying the electric light will know that the public, being now more enlightened on this subject, will not be content with any half measures. Our desire in making these remarks is not so much to criticise adversely the action of the electric light companies, as to induce them to bring every effort to bear on the effective organisation of their systems during what may be termed the "off" season, so as to be in perfect readiness for any calls upon their resources. Large demands are certain to be made during the forthcoming winter, but what we fear is the inability of the electric light companies to meet the requirements of the public. This has been so up to the present, and although we are told that there now exists a *mania* for the electric light, the suppliers of this light have not made the advances we should have wished to see towards satisfying this latest desire of the public.

HALF TRUTHS AND WHOLE TRUTHS.

IT is no doubt due entirely to misconception, or to slight misunderstandings that the statements made sometimes in prospectuses and price lists relating to some electric lighting companies contain inaccuracies chiefly as regards the candle-power of their lights, and the engine-power which is required to produce them. That discrepancies may exist in taking photometric tests is not surprising; electric arc lights are naturally rather inclined to be unsteady, and as the photometer has to follow the vagaries of the light, it must be puzzling in the extreme for a well regulated-minded photometer to decide exactly where its fate may be to ultimately come to a balance. In some electric arc lights when indirectly regarded photometrically, there is something of the *ignis fatuus*, and the point of balance is then extremely hard to catch hold of, and that an average or even a guess may sometimes necessarily do service for the nonce is pardonable. But indicator diagrams are always possible to take, and there should be no uncertainty whatever in regard to them. The same, or very nearly so, may be said of dynamometers. At least, in regard to the engine-power, there is not the same excuse for inaccuracy as there is for photometric measurements of an unsteady light, and in all conscience some of our arc lights are unsteady enough. Judging from the statements as to efficiency and performance of some electric lights—we are careful to mention none in particular—one can only come to the conclusion that either the light has exaggerated itself greatly at the moment of its photometric measurement, or that the photometer employed has been of doubtful accuracy, or that the nominal instead of the indicated horse-power of the engine must have been introduced as a factor into the calculation. That such an oversight has occurred by accident is within our knowledge but it cannot be frequently repeating itself. Then, another source of inaccuracy is sometimes due to excess of zeal on the part of gentlemen connected with certain electric lighting companies, whose energy and business capacity places them in the foremost rank, but whose engineering training has been unhappily a little neglected. These gentlemen are always ready and anxious to have their lamps "on show," and especially on such occasions are not backward to show themselves off as parts and parcels of their system. And with such busy people it is wonderful how the strictest honesty and fairness on their parts may be liable to miscarry. We know of one instance in point, where a learned physicist was called in and requested to make photometric tests of a certain electric lamp, which he did, gave his report, and received his fee. Then, in order to be supported by the very best authority, a few days afterwards a celebrated engineer was instructed to come and measure and report upon the engine-power consumed by a certain number of lights. The man of business, whose capacity, as he termed it, was to "put two and two together," put these two reports together, and the result was something wonderful. We forget exactly what the figure was, but we think the conclusion was that the lamps were giving something less than ten thousand candles per horse-power.

Then we have statements which are strictly the truth, but not, strictly speaking, all the truth. The statement, for instance, which we sometimes hear, that each lamp of an electric light system costs so and so much horse-power, must not be supposed in every case to represent the total energy expended to produce the result, because that portion which is required to produce the magnetism of the distributor or machine is frequently entirely left, by an oversight, out of account. A very common way to illustrate the efficiency of a system is to put, say, twelve lamps at work in a circuit, each lamp equal to, say, 1,000 candles, and to measure by a dynamometer the power being expended; then one of the lamps is extinguished, and a new indication of the dynamometer is noted representing, say, one horse-power less than before; a second lamp is extinguished, and the process is repeated, the dynamometer indicating another horse-power less; and so on till all the lamps are one after another extinguished, and there the operation ends, and in nine cases out of ten the mere statement of this result is taken to mean that to produce one lamp one horse-power is necessary, and that twelve lamps cost twelve horse-power. It does not generally mean anything of the sort. If the observation is carried further, in most cases it will be found that the machine is still magnetised when all the lamps are extinguished, and where this is the case this magnetism may cost several horse-power to produce. In such instances, of course, the more lamps which can be worked at once the better. A sufficient distinction is not always made in statements published in prospectuses, between the efficiency of the arc or what may be termed the candle-power per horse-power of current, and the efficiency of the machine producing the current. It is not fair, for example, to state that each lamp of a dozen under examination, consumes so and so much power if the inseparable operation of the machine is omitted. Take as an instance, in some late prospectuses, the performance of complete systems of electric lighting have been stated in such a way as to give no possible indication whatever of the efficiency of the systems as systems, nor even of the actual illuminating power of the lamps used. Some high-sounding values are given which, although true enough as far as they go, are such half truths, as to be easily misleading to outsiders. We refer, in particular, to the isolated statement, that a light photometrically tested, gives so many thousand candles-power per horse-power "consumed in the arc," or "consumed in the lamp." Of course the figure sounds grand, and the innocent outsider runs away with the stupid notion, that in such and such a system ever so many thousand candle-power will be got for every horse-power expended. Not at all. The information conveyed is really about as complete as that of the stoker, who being asked how much coal he burnt a week replied, that "a ton of coals cost twenty shillings." As a rule, it may be taken, that on an average in electric arc lighting systems, half the power developed by the steam engine is at least expended in the engine, the dynamo machine, and the leading wires, and the other half in the lamps; but this relation varies greatly with different systems, and in their variation lies just the relative goodness or badness of each system. Take as an illustration a system in which each lamp gives at a certain angle a candle-power of five thousand and costs two indicated horse-power. If the difference of potentials of the carbons and the current are measured, the product multiplied by a certain co-efficient gives the equivalent for this electricity in horse-power, and we may not be very far from the truth in stating that this is "the horse-power given to the arc." In certain cases we shall find it about half of that indicated by the engine, that is to say, one horse-power shown electrically "in the arc" produces, say, five thousand candles. But although this may approximately be true enough (and it is at best only an approximation) it is scarcely honest to state this fractional truth without adding that the expenditure of another horse-power is inseparable from the machine and leads. Now as a matter of fact, the candle-power of any given light depends upon the nature of the carbons as well as upon the electricity passing between them. The lamp itself having merely to keep the carbons in their proper places has frequently about the same relation to the candle-power that a candlestick has to the burning of the wax or tallow candle which is stuck in it. The efficiency of the lamp is therefore its capacity to keep the carbons in their places. The real criterion of a system is not the candle-power given by a certain current of electricity between certain potentials, which is the meaning of so-called electrically measured horse-power, and which may be quite independent of the merits of the system; but the smallness of the attendant and unprofitable expenditure outside the arc in leads and machine. We have known two machines which gave identical currents under similar circumstances, and therefore identical lights, while one was absorbing over 50 per cent. more engine-power than the other. Stated by the mere fractional truth system of the candle-power per horse-power "given to the lamp," each system would have appeared exactly equal; stated honestly, by the actual expenditure of fuel to produce the same result, one system was 50 per cent. better than the other. The candle-power which a given current between given potentials of the carbons produces is in the nature of a physical constant; the accompanying expenditure of power in leads and machine—that is, a criterion of the proportioning of the leads and the construction of the machine—is the information which we expect to have placed before us, if any is placed before us at all. Half truths may be misleading to those outsiders who in all good faith may risk their money in undertakings in which, unhappily, their risk needs from the nature of things nothing to increase. It is advisable, therefore, that the other half of the truth should not be overlooked. Such statements as those we allude to may occasionally be meant in perfect honesty, and from an innocent desire on the part of the engineer to get a value which may be expressed in horse-power with as little trouble as possible, or in the not unnatural bias towards an oblique advertisement of some little testing instrument of his own design. An expert would, of course, understand exactly what is meant, but investors are not experts generally speaking, and although their ignorance may be their own fault, directors and engineers who have a regard for their own reputation should make allowance for their want of technical knowledge by a scrupulous attention to such details as will make facts specially clear to them.

Another common expression amongst those vending electric lamps is, that a certain form of lamp gives a light of 1,000 or 2,000 candle-power as the case may be. This is true enough in one sense, that is, if sufficient current is passed through the carbons. But we never by any chance hear of the one in connection with the other. This kind of thing is not altogether confined to those whose knowledge of the subject is known to be little or nothing, but may frequently be heard even amongst electric light engineers of more than local fame.

To arrive at a correct estimate of the efficiency of any system of electric lighting, it is quite clear that the true statement of three things is necessary, viz:—

1. Horse-power done by engine.
2. Current and $\left\{\begin{array}{l}\text{resistance, or}\\ \text{potential}\end{array}\right\}$ of lamp.
3. Amount of light.

If one of these is omitted it should be number 2. Certainly not either of the others, because whilst 1 and 3 give reliable end results—that is, how much light is got for so much horse-power actually expended—neither 1 and 2, nor 2 and 3, separately contain the data necessary for judgment. 1 and 2 alone exclude the light, an important element, whilst 2 and 3 alone exclude actual cost.

A certain current of electricity going through a certain $\left.\begin{array}{l}\text{resistance}\\ \text{potential}\end{array}\right\}$ of the arc under examination, affords a certain quantity of light—that is clear, but what it costs to produce the current is quite another matter; and the trick of expressing the current and $\left\{\begin{array}{l}\text{resistance}\\ \text{potential}\end{array}\right\}$ in horse-power, although it sounds very engineering, does not help the matter in the least; in fact, it is a mere shallow artifice which is designed to make a superficial impression that the horse-power has actually been measured when it has not, and to obtain a high value of candle-power which is misleading. Then again, as to the photometric measurements of electric lamps, we know of no better commentary upon the *modus operandi* of such puffs than what we read between the lines of the latest advertisement of a leading Company, that "by their improved method of determining the candle-power of electric lights, it is found that their ordinary lamps yield 2,000 candle-power each." The "improved method" being a photometer which, by the inventor's own confession, gives a highly exaggerated result in comparison with better known systems, and by a method of statement which leaves all the actual data for forming the remotest judgment of the comparative economic advantages of the system purposely out of sight.

There recurs in every electric light prospectus the statement that "the electric light is cheaper than gas." This is another instance of truth, but not all the truth. We have been seriously recommended by credulous investors to abolish gas in our house and take such-and-such a company's electric lights, generally the incandescent ones, because it is so much cheaper than gas. As a matter of fact, to replace our present gas illumination by an equal illumination by any form of electric light, would cost ten times at least what gas costs; to go no further than the first outlay in machine and wires, the interest alone on this is in excess of the average gas bill of a good sized house. It is only when we come to deal with higher degrees of illumination that the great economy of electric lighting steps in. To substitute the gas bill, which we content ourselves with, for that of any form of electric lighting, would be to treat ourselves to a luxury—the luxury of either more light or the luxury of a pure atmosphere—and this luxury must be paid for as every other. We need scarcely remark that we are speaking of private installations of the electric light in houses of moderate size. If we were to require such an illuminating power as to necessitate thousands of candles or hundreds of gas-jets, then the arc electric light would replace them with economy. Light for light, electricity is the cheapest, as the matter now stands; and when we have large central stations for the unlimited production of electricity, which will be laid on in our houses as gas is at present, our new illuminant will stand on a far more favourable footing. A little more explanation upon this point in some prospectuses would lead to less foolish credulity on the part of investors, whose want of discernment and common sense is responsible for their errors, but who will none the less be ready when the day of disenchantment comes—as come it must before long—to charge their directors with wilful misrepresentation.

Then again as to street-lighting by electricity, contracts for which, we suspect, have been taken at prices which, unless unforeseen good luck steps in to the rescue, must lead to serious losses sometimes on the part of contractors. Contracts of this kind are, perhaps, sometimes taken at nominal prices with the full knowledge that money will be dropped upon them, but in the hope of the public exhibition and its advertisement for the system employed resulting in an ultimate gain. If the contracting company were strong enough to renew the contract year after year perhaps in the long run the end would be gained, supposing that the liking for electric lighting does not exhaust itself in the meantime; but if at the end of the contract the company have to withdraw, unable or unwilling to sustain a further and certain loss, the prestige of the system employed is damaged, and unless some singular good fortune or clever financial operations have, during the existence of the contract, picked up the loss incurred, the contractors have to add a pecuniary loss to the acknowledged defeat of their system.

THE EGYPTIAN CRISIS.—It is reported that Lieutenant Marriott, of the *Monarch*, is organising a volunteer force among the Europeans obliged to remain at Alexandria, and has established telephonic and heliographic communication with the fleet.

A SIMPLE METHOD OF MEASURING THE RESISTANCE OF ELECTRIC LAMPS WHEN BURNING.

By H. R. KEMPE.

THIS method is so extremely simple and self-evident that I can hardly believe it to be novel, but I am not aware that it has ever been published.

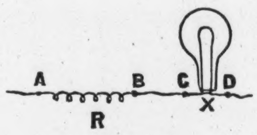


FIG. 1.

In this method a resistance, R, is inserted in the circuit of the lamp whose resistance is to be measured, and then the potential, V, between the points, A and B, is measured by the condenser discharge method (see ELECTRICAL REVIEW, June 17th, page 435). A similar measurement is then taken of the potential, V_1, between the terminals, C and D, of the lamp. We then have—

$$x = R\frac{V_1}{V}$$

Thus, for example, suppose the resistance, R, was 1 ohm, and suppose that the discharge deflection obtained by the condenser from the points, A and B, was 250 divisions, there being no shunt to the galvanometer: also suppose that the discharge deflection obtained from between the points, C and D, was 260 divisions, the galvanometer, whose resistance was 6,100 ohms, being shunted with a shunt of 200 ohms; then we have—

$$V = 250$$

$$V_1 = 260 \times \frac{6{,}100 + 200}{200} = 8{,}190$$

Therefore,

$$x = 1 \times \frac{8{,}190}{250} = 32{\cdot}8 \text{ ohms.}$$

If the discharge given by a standard Daniell cell in thorough good condition were 140, then we should have—

$$\left.\begin{array}{c}\text{Electromotive force}\\ \text{between points, A and B...}\end{array}\right\} = 1{\cdot}079 \times \frac{250}{140} = 1{\cdot}93 \text{ volts,}$$

1·079 being the electromotive force in volts of a good Daniell cell. The current flowing, therefore, equals—

$$\frac{1{\cdot}93}{1} = 1{\cdot}93 \text{ ampères.}$$

In cases where the current flowing is powerful, and where it is not advisable to introduce so high an extraneous resistance as 1 ohm into the current, R could be made $\frac{1}{10}$th of an ohm.

The method described is put forward as being more particularly useful for measuring the resistance of electric lamps, but it is obviously equally applicable for measuring ordinary resistances.

For

Measuring Low Resistances

the principle could be applied with great advantage and without difficulty. An ordinary Thomson galvanometer when adjusted with ordinary care, will give a discharge deflection of 200 divisions from a condenser of $\frac{1}{3}$rd microfarad capacity charged by 1 Daniell cell. If instead of $\frac{1}{3}$rd microfarad, the capacity of the condenser were 10 microfarads, then the discharge deflection obtained would be

$$200 \times 30 = 6{,}000$$

Therefore a deflection of 60 divisions would represent an electromotive force of $\frac{1}{100}$th of a volt.

Now suppose we joined up, say, 10 Daniell cells, each having an internal resistance of less than 1 ohm, in circuit with a standard resistance of 1 ohm and we included in the circuit the low resistance whose value is required; then as there would practically be a current of about 1 ampère flowing in the circuit, the potential at the two ends of the low resistance would, if the latter were $\frac{1}{100}$th of an ohm, be practically $\frac{1}{100}$th of a volt, and this potential would give a discharge deflection of 60 divisions, that is to say this potential could be measured to an accuracy of $\frac{100}{60}$ or 1·6 per cent.

To determine the value of the resistance, as has been explained, we have merely to measure the potential at its ends, and also the potential at the ends of the 1 ohm resistance, and then the value of the unknown quantity is obtained by direct proportion. As in measuring the potential between the ends of the standard resistance we are liable to make an error of $\frac{100}{D}$ per cent., D being the deflection obtained, the total possible error would be $\frac{100}{60} + \frac{100}{D}$ per cent.; if D, for example, were 300 divisions, then the possible error would be $\left(\frac{100}{60} + \frac{100}{300}\right)$ per cent. $=$ 2 per cent. approximately.

Practically, therefore, we see that by this method we could measure a resistance of $\frac{1}{100}$th of an ohm to an accuracy of about 2 per cent. A higher resistance could of course be measured to a greater degree of accuracy, since the higher the resistance the greater would be the potential at its ends, and the greater the deflection that could be obtained. If the deflection were 300 divisions, instead of 60, then an error of 1 division would mean an error of only $\frac{100}{300}$th per cent., so that the total possible error from the two measurements would be $\left(\frac{100}{300} + \frac{100}{300}\right)$ per cent. $=$ ·67 per cent. If the resistance to be measured is high, it will be necessary to make the standard resistance high also, otherwise the potentials at its ends would be so small as not to give a good discharge deflection.

Instead of employing a condenser for measuring the potentials, the latter may be observed by connecting the galvanometer direct to the points at which are the potentials to be measured, the resistance in the galvanometer circuit being sufficiently high not to reduce the resistance between the points.

Now, a Thomson galvanometer, wound to about 5,000 ohms resistance, will give a deflection of 100 divisions with one Daniell cell, there being in circuit a total resistance of 10,000,000 ohms. Hence, if there be no resistance in the circuit beyond that of the galvanometer itself (5,000 ohms), the deflection would be

$$100 \times \frac{10{,}000{,}000}{5{,}000} = 200{,}000 \text{ divisions,}$$

representing an electromotive force, or potential, of 1 volt approximately; hence 200 divisions would represent a potential of $\frac{1}{1{,}000}$th of a volt. By measuring potentials in this way, therefore, it is evident that we can determine them much more closely than by the condenser method. We could easily, in fact, determine the value of a resistance of $\frac{1}{100}$th of an ohm to an accuracy of $\frac{1}{3}$rd per cent.

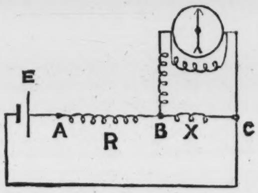


FIG. 2.

Fig. 2 shows the general arrangement of this method of measuring a low resistance. E is a single Daniell cell, having a resistance of, say, 4 ohms; A B is a standard resistance of 1 ohm; B C is the resistance to be measured. Now, if B C be $\frac{1}{100}$th of an ohm, then the potential between its ends will be approximately $\frac{1}{500}$th of a volt, so that in order to bring the galvanometer deflection to 300 divisions there would have to be a total resistance in its circuit of—

$$5{,}000 \times \frac{2{,}000}{500} \times \frac{200}{300} = 13{,}333 \text{ ohms.}$$

That is, 8,333 ohms in addition to the resistance of the galvanometer itself. Suppose that the deflection actually obtained between the points, B C, was 320 divisions, there being a resistance of 8,000 ohms inserted in the circuit, then if the galvanometer resistance be 5,000 ohms the total resistance in current will be 8,000 + 5,000, or 13,000 ohms. Next suppose that when the galvanometer was connected to the points, A and B, the $\frac{1}{1000}$th shunt was connected to the instrument, and that a resistance of 1,200 ohms added in the circuit brought the deflection to 310 divisions, then the total resistance in the circuit would be—

$$1{,}200 + \frac{5{,}000}{1{,}000} + 1 = 1{,}206$$

Consequently, the relative values of the potentials between the points, A B and B C, must be in the proportion—

$$1{,}206 \times 310 \times 1{,}000 \quad : \quad 13{,}000 \times 320$$

or, $$373{,}860{,}000 \quad : \quad 4{,}160{,}000$$

Hence $$x = 1 \times \frac{4{,}160{,}000}{373{,}860{,}000} = \cdot 0111$$

And we can be certain of the accuracy of this result within—

$$\left(\frac{100}{310} + \frac{100}{320}\right) \text{ per cent.} = \cdot 64 \text{ per cent.}$$

approximately.

TELEPHONIC SYSTEM OF VAN RYSSELBERGHE.

[In our last number we gave an interesting description of M. Dunand's speaking condensers. For the information there given we were indebted to our contemporary *La Nature*. The following description of Van Rysselberghe's telephonic system has been written by M. Hospitalier for the same journal.]

WE know that one of the principal difficulties met with up to the present in telephonic transmissions to a great distance results from the powerful inductive effects produced on telephonic conductors by adjacent telegraph wires, and which have been appropriately compared to the sound of *frying*. Many plans have been proposed for overcoming these effects, but until now all efforts have been confined to the telephonic circuit (the seat of the disturbances). M. Van Rysselberghe has turned his attention to the cause itself, *i.e.*, to the telegraphic circuit (the cause of the disturbances), and, after a long course of researches and experiments, he has arrived at the two following results:—1st, the suppression of the inductive effects of telegraphic currents on telephonic circuits without employing double wire; 2nd, the simultaneous transmission of a telegraphic despatch in Morse signals and a telephonic message by one and the same wire.

We shall now show the principles which have been applied by M. Van Rysselberghe in order to obtain the first result, *i.e.*, the suppression of the induction currents, and then we shall more easily be able to explain the system of double transmission, the description of which we reserve for a future number, in order to add to it some explanatory diagrams.

We have said that M. Van Rysselberghe, in order to suppress the inductive effects, turned his attention to the *cause* itself. In order to understand his mode of procedure, let us examine what happens in the most simple case (fig. 1), that of a telegraph line and telephonic line running parallel to each other, with the extremities of the wires connected to earth, *i.e.*, with the *simple wire* method of arrangement, as in all the telegraphic systems known.

Each time the transmitting key, M, is pressed and an emission of current along the line is produced, this line becomes charged almost instantaneously; all the wires near

—and in this particular case the telephonic wire—are traversed by a powerful induction current of short duration. The same phenomenon occurs, but in an opposite direction, when the circuit is broken. This series of powerful induction currents of short duration produces in the telephones a sort of hissing, more or less detrimental, according to the number of telegraph wires, so that reception is often rendered impossible.

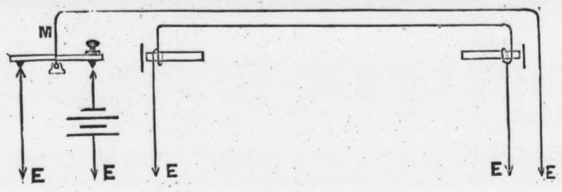


FIG. 1.

Let us now suppose that it is possible, by some means or other, to *graduate* the inductive current so that it can only attain its intensity by degrees; the induced currents developed in the telephonic circuits will then last longer, but will be less intense; the action of the plate of the receiver will also be gradual, and no perceptible sound will be produced. In fact, a violent and instantaneous attraction will have been exchanged for a series of weak and successive effects. We may form some idea of the result obtained by comparing it to the effects produced by the reservoirs of air in hydraulic tubes, and also to that trick of travelling mountebanks, based on inertia, and which consists in breaking, with powerful blows of a hammer, a heavy paving-stone placed upon them. In order to deaden the electric wave of induction and suppress the hissing which this wave would otherwise produce, M. Van Rysselberghe employs various methods. We shall describe two, which gave good results.

One consists in employing manipulators furnished with adjustable rheostats, arranged in such a manner that by pressing down the lever of the manipulator, resistances varying progressively from infinity to zero are introduced into the circuit, between the battery and the line. These rheostats are formed of bodies of moderate conductivity, on which rubs a brush fixed to the lever of the manipulator.

The line therefore becomes charged gradually and comparatively slowly, since the intensity of the current varies with the resistance introduced during the pressing down of the key of the manipulator, and the inductive effects are no longer sufficiently powerful to trouble the telephonic transmission. This transmission, established on a distinct circuit, could also be effected, either by magnetic telephones or by telephones with batteries and microphonic transmitters.

A second method employed by M. Rysselberghe also enables the induction to be overcome without in any way interfering with the arrangement of the manipulator. It consists in arranging in derivation on the line a condenser, C (fig. 2). At the moment when the circuit is closed the flow of electricity is divided between the condenser and the line; the latter therefore receives its charge only by degrees. The desired result is thus attained in a certain measure; by combining the two methods, *i.e.*, the manipulator with variable resistance and the condenser in derivation, the injurious effects are completely annulled; and it is this combination which, in practice, gives the best results.

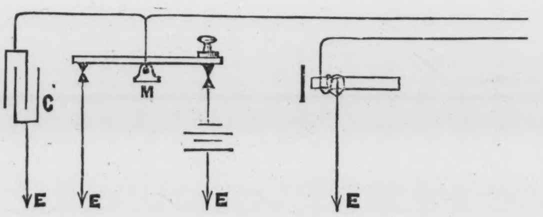


FIG. 2.

It is owing to this entire suppression of the induction effects produced by the currents of the Morse manipulators that M. Van Rysselberghe has been able to combine the two instruments and employ the same wire for the simultaneous transmission of a telephonic message and a Morse despatch.

Let us add to these results the important improvements effected in telephonic transmitters and receivers by M. Van Rysselberghe, and we shall then form some idea of the importance and interest to be attached to the researches of the young sub-director of the Observatory at Brussels, researches concerning which we shall soon give fuller information.

ENGINEERS AND ELECTRICITY: A PROTEST.

WE have on various occasions found ourselves under the necessity of criticising adversely the effusions of so-called "electric light engineers" who, without ever having studied even the elementary portions of the science to which we devote our columns, rush into publicity either by writing books, lecturing, &c. This is done usually on the strength of having set up a dynamo-electric machine and a few lamps on one or two occasions, after which the previous "tyro" comes forward as a fully fledged "professor" of electrical science, or at any rate that part of it concerning the electric light. How far we have been justified in the course we felt it incumbent upon us to take we will leave our readers to judge, but at the same time we desire to call attention to a letter which appeared in last week's *Engineering*, which we consider of sufficient importance to reprint in full. It was published under the above heading, and is as follows:—

To the Editor of ENGINEERING.

SIR,—Supposing that some one had invented an instrument which enabled us to look behind the moon, and that by the use of this instrument a new force—say a lunar force—had been discovered, which was found to have a beneficial influence upon the development of human happiness and wisdom; would you be surprised to hear that the greater number of people, even amongst those who, up to the time of this discovery held the moon beneath their notice, had become prophets of this lunar force, and developed into professional lunatics?

Knowing that there is no royal road to learning, you would naturally answer in the affirmative; although your intimate acquaintance with the presumptuous character of the human mind in its modern development would cause you to admit that such a phenomenon might be possible, namely, the phenomenon that every one who can put a decent sentence together asks you to believe that he could lecture you on the new lunar force. Now I do not intend to discuss in your columns the question of who is and who is not a lunatic; the gradations of which the mental faculties are capable would make this a most difficult task; but I beg to call in question the right and the propriety (the wisdom we may leave out) of certain writers in public journals, or in books, or in dissertations before scientific societies, to lecture us on electricity and electric engineering, when the social standing of such writers cause their ignorance to be reflected upon the profession to which they belong; in short, I protest against the presumption of a certain class of engineers who either serve up for our enlightenment or for the general public information (*sic*) as the last outcome of engineering science and skill, their assumed knowledge of the science and phenomena of electricity.

Had this tendency shown itself in a single instance, it might be passed over; when, however, cases multiply, and when, furthermore, the ignorance in electricity shows itself in quarters where one looks for instruction, and where the outside public expects to find the pith of sound knowledge—it is high time that a voice should be raised against such "electricians;" and I only regret that no abler pen than mine has been taken up against such sham science. Allow me space, please, to give specific cases.

Some time ago a friend in the country desired information on the electric light, to guide him in his choice between this light and gas. Want of time to write a long dissertation tempted me to call in the aid of a little book upon electric lighting, and written "by ——, Fellow of the Chemical Society; Member of the Telegraph Engineers; Member of the Mechanical Engineers; Associate Member of the Institution of Civil Engineers." (These titles are printed in full, so that there should be no doubt about the author's scientific standing.) This little volume has reached the "third edition, revised and enlarged," and is published in the year of grace 1882.

Just what I wanted! So I thought, at least; and, delighted at the idea of giving my friend an opportunity of acquiring the "useful information" he desired, I purchased the volume. I was, however, conscientious enough to inquire how I fulfilled my trust, and hence looked into the book. I very soon discovered that I was on the point of making a great mistake. It appeared to me evident that a reader who knows little or nothing about electricity would, by the perusal of the book, become thoroughly bewildered; another class of readers possessing a "little learning" would get their heads crammed with wrong ideas on the subject, which it would be difficult to unlearn again; whilst electricians (not in name only) would throw the book aside in disgust.

To give some idea of the contents of the book I will make a few extracts:—

Pages 2 and 3: "A coil of wire through which a current is passing exercises an attractive action on a piece of iron introduced into the coil. Such a *combination* is known as a solenoid.

"Magnets *are said* to have two poles, north and south." (The author is evidently in doubt whether or not besides those two which *are said* to exist, east and west should not be added).

"Dissimilar poles attract; similar poles repel."

"Solenoids act in the same way; a current which will draw a piece of iron into a coil, if reversed, will repel it." (This is no doubt owing to the newly-discovered lunar force).

Next follows a unique description of an "*induced coil;*" and at page 5 a very "*lucid*" distinction is drawn between magneto-electric and dynamo-electric machines.

Page 6: "On revolving *an* induced coil between the poles of a magnet, the same action takes place as when two galvanic batteries of the same number of cells are opposed to each other by poles of the same name." (This paragraph seems to be formed of two cuttings from a book on electricity which have been accidentally displaced).

"If *two* bobbins are united (as in the case of an ordinary electro-magnet, and revolved before the poles of a permanent magnet, the current set up in the bobbins is alternating in direction." (It seems that the compositor has played a trick upon the author by jumbling various sentences together irrespective of the logic conveyed by them. The author himself seems to feel that the above requires qualifying, hence he adds), "*This is shown in practice* by the action of Holmes' lighthouse machine."

Page 9: "The effect of quantity and intensity has been compared to two vessels, each holding the *same amount of water*, but one being flat and shallow" (like some people's cranium) "and the other tall and narrow." And so on.

I could multiply these citations, but shall conclude with the following extracts.

Page 35: "The leading wires from the machine should be of sufficient length to offer a resistance equal to the lamp or lamps."

Page 52: "The reason for using the exciter is, that when an electro-magnet is produced by a current from a separate machine the magnetic field or attractive power of this magnet is far more powerful than if *the magnetism had been induced (sic) only by the revolution of a coil of wire in front of it*. This plan was taken advantage of some time ago, and is always used whenever high tension alternating currents are required."

Page 65: "Sparks given off at the commutator or elsewhere" (perhaps in some people's brain) "are a sign that the connections of the machine are at fault or in some way improperly worked. It is hardly possible to avoid these altogether, but if present to an injurious extent, the commutator plates will be found to wear very quickly. This unfortunately *is the great disadvantage of separately exciting*, and in some cases has led to its abandonment."

It is certainly surprising that the author should have had the audacity to publish such utter nonsense under the pretext of offering "useful information." Whenever he steps beyond the mere statement of simple facts and attempts to give scientific explanation of electrical phenomena he evinces an ignorance of the principles involved which is truly lamentable; and well may a critic in the Electrical Review advise him to apply himself to learn the rudiments of the science of electricity before offering information to others.

I listened some time ago to a paper, read before the Society of Engineers, "On Notes on Electric Light Engineering." The title of the paper and the place where it was to be submitted to criticism, seemed to promise a thorough practical handling of the subject, to be supported by data from actual installations; and it appeared as if my anticipations would be verified. The paper commenced by showing that the accidents that had happened were owing to "insufficiently careful engineering;" and then mentioned the possibility, from experience already gained, of *indicating* "the directions in which engineers and electricians must work in order to arrive at the most economical and most complete system of electric lighting plant. Much of the progress . . . . has been effected by engineers and machinists" (we certainly ought to be very proud) "who have turned their attention to the subject. The electrician alone has moved slowly (!!!), but the combined labours of the members of these two professions have brought about a sufficiently wide application of electricity for lighting purposes *to enable us now to take stock of the information* which has been obtained by the work thus carried out."

This sounded very practical and promising, and raised my expectation of what was coming. The two authors, I concluded, combined the "go-ahead" combination of engineer and electrician, which enabled them to give us a *resumé* (stock-taking) of the labours up to date.

The paper then proceeds to state what everybody knows; it enumerates the points to be considered, kind of light, lamp, generator, motor, &c.; makes some general remarks about incandescent lamps (which can be found more complete in the many descriptions which appeared from time to time in your journal); and then *mentions* the desirability of choosing a suitable machine without indicating how such choice is to be made; but refers to the electromotive forces required for various lamps, and winds up with the important information:—

"Thus a certain electromotive force is wanted to overcome, *so to speak*, the resistance, and to put the lamp in a certain condition, as well as a certain quantity of electricity to keep up the condition." This common-place style is continued in reference to the units of electromotive force and resistance, this latter culminating in a table giving the rate at which resistance increases with temperature, which table looks very scientific, but is out of place in—because it is out of harmony with—the paper.

Yes, the question of resistance is no doubt of the greatest importance; but let us see how the authors treat it in their discourse:

"The external part of the circuit is the one coming under the control of the engineer after the machine is made, and it is here that his knowledge of the laws affecting resistance can be applied in the successful arrangement of electric lighting plant."

You would think very naturally that the authors now intend giving us their experiences in the working of the dynamo machine as influenced by the external resistance, &c.; but just listen to what follows:

"We shall not enter into minute details, these will be found in the text-books."

Of course, before a scientific society the authors would not deal with subjects which every one can learn from text-books written for school-boys; they take a higher view of the aim of their paper, and continue as follows:

"Generally, then, every substance resists more or less the passage of electric currents, some, such as metals, resist the passage but slightly, and are called good conductors; others, such as glass, shellac, gutta-percha, &c., offer an enormously great resistance, and hence are called non-conductors or insulators."

To dish up these platitudes after such grandiloquent language of avoiding minute details, because they can be found in text-books, is certainly puerile, and says little for the electrical knowledge of the authors. It seems throughout that the text-books have been called into requisition, since the calculations brought forward are chiefly those which can be found in books on electricity. And where the special nature of the subject might give an opportunity for being original the question at issue has been avoided.

"We have now glanced at a few of the calculations with the methods of which it is necessary the electric light engineer should be perfectly familiar. *It is unnecessary for us to describe the practical methods employed for finding resistance, electromotive force, &c. These are pretty well known.*"

Now, I maintain that among the subjects which are constantly in every would-be electrician's mouth, there is none with which he is practically less acquainted, and in which a text-book cannot help him out, than the determining of the electromotive force of any source of electricity; or the difference of potential of any two points in a circuit. It is not only the special method adopted, but also the handling and the knowledge of the character of the instruments employed in which most experimenters fail, and just here the authors had an opportunity of displaying their capabilities.

With regard to the calculations required for resistances in multiple circuit (of which a not very edifying specimen is given), I would call the authors' attention to Mr. Kempe's book "On Electrical Testing," in which he gives the calculation of compensating resistances for galvanometer shunts, as an example of what electrical engineers have to learn before they can consider themselves acquainted with the subject.

A paper of such a character cannot engender a healthy discussion. This generally takes the form of questions and answers, and it is a significant fact that gentlemen are not above asking some very simple question for which an answer might be found in any text-book ("Would Professor Y. be kind enough to explain why this is thus?") but who would be ashamed to go to college again and acquire a sound acquaintance with the subject on which they are anxious to display their knowledge. I have heard engineers say that their position precluded them from going to a laboratory to study the practical working of the laws of electricity, although they felt offended if any one doubted their being an authority on the subject. Well may one of the speakers in the discussion after the paper declare, "We engineers have still a great deal to learn before we can consider ourselves electricians."

One of your contemporaries has always been looked upon as a journal intended for professional engineers and scientific readers, and if any one were to intimate that its articles, so far as they emanated from the editor and his staff, were written for the general public, which requires dry scientific subjects a little spiced, to make them piquant, if even at a sacrifice of truth, the editor of the journal would feel highly offended, he would ward off such an insinuation with disdain, and very justly so, because we all are convinced that the contents of the journal in question are *intended* for scientific readers only.

An article recently appeared, however, in your contemporary entitled, "How the Electric Light is Produced," which in title not only, but especially in the manner in which the subject was treated, would seem to indicate that the editor caters for another class of readers besides engineers and scientists. The title of the paper savours a little of some cheap popular periodical; and although the writer, when putting his knowledge to paper, says in the introduction that he does so in consequence of his having "arrived at the conclusion, that by far the greater number of engineers know next to nothing about electricity," in which conclusion I think he is quite correct, since he proves his point in the article; yet a little further on he says, that "the *progress* of electric lighting *has brought the subject home to every one. Electricity has been popularised.*"

So the writer addresses himself to every one who wants to know anything about it. For, "nothing can be easier than the acquisition of this knowledge, and this article is specially intended to supply it." (Mental food for the million.)

Let us see how our author has *popularised electricity*. To ward off criticism beforehand he tells electricians that he does not write for them (as they would naturally complain that "we have left a great deal unsaid that ought to have been said," and let me add, *vice versâ*), but for thousands of persons, who know nothing about the electric light; and he takes his stand-point from which he views his subject, in the endeavour to answer the supposition "that the dynamo is regarded as quite similar to the plate glass frictional machine, and "that the electricity is got out of it by something which rubs on something else." Highly complimentary this to the intelligence of the reader. The writer takes his subject by paragraphs, and his inspiration carries him away at the very first sentence.

(1) "No one knows what electricity is, but for practical purposes it is convenient to regard it as a fluid.

(2) "No one knows what a current of electricity is, but for convenience it may be regarded in the same light as a current of water.

(4) . . . "if a hole be made in the gutta-percha" (insulation) "the electricity will flow out through the hole and be lost, *exactly as water would flow out of a pipe split by the frost.*

(5) "No one knows what magnetism is, but magnetism and electricity are nearly akin. When we see smoke we augur that fire is not far off. In like manner when we see a magnet we may take it for granted that electricity is close by." (Worthy of Herbert Spencer).

(8) "Frictional electricity, that is to say, electricity obtained by rubbing glass or sealing wax, is useless for obtaining the electric light. *We think it better not to explain why;* because to do so we should have to say a good deal about quantity and intensity." (He is quite right there, Sir; I think we all agree with him, for there could be no better proof that engineers know nothing about electricity than his reasons for not explaining why).

(10) "The dynamo is not a frictional machine." (This is news indeed; it should be written in every engineer's note-book in golden letters).

(21) "A coil of insulated copper wire meets with a great deal of resistance in passing through a magnetic field, not because the magnet attracts it, for copper is not attracted by magnets." (Words of wisdom.) "The resistance is as though the coil were *dragged* through a thick treacle." (Oh! sweet imagination).

There is but one more paragraph to which I have to refer, although the whole article will give food for exercising our risible faculty; for, unquestionably, the writer evinces an uncommon degree of humour, and a wonderful faculty of showing scientific subjects in an absurd light, which makes his article pleasant reading.

(32) "If into a circuit" (for a scientific definition of which see 31) "we introduce a length of any material which is a bad conductor, that material *will cause resistance and become highly heated.* Thus, if in the bit of circuit" (illustrated in Fig. 11, in which a piece of slate, 15 mm. long, is inserted between two copper conductors) "were introduced a *very short length of a non-conductor, such as slate, it would be heated and broken up.*"

But, Sir, this article, which has afforded us half an hour's amusement, has another and somewhat serious aspect. The ignorance displayed is unpardonable since sound information can be obtained in books, in the laboratory, and the workshop; and unless such unscientific lecturing is not suppressed or publicly denounced, our reputation as engineers will suffer in the eyes of not only electricians, but also of our Continental and American *confrères.*

Hence I protest against the publication of such presumptuous writings, and have no doubt that I shall be joined by many others of your readers, who do not desire to be considered as accomplices by tacitly tolerating this class of teaching.

I am, Sir, yours faithfully,
Omega.

REVIEWS.

Le Microphone, Le Radiophone, et Le Phonographe. Par Le Comte Th. du Moncel. Paris: Librairie Hachette et Cie.

The extraordinary energy which Le Comte du Moncel shows in stringing together the scattered information which exists upon recent electrical discoveries has earned him the thanks of a large number of readers, and the present work, which he has lately brought out, has only increased the debt of gratitude which is due to him.

The book being really a collection of facts, hardly admits of criticism, as there are practically no new opinions set forth in it other than those which have already been published. We think, therefore, that it is unnecessary to say more than to strongly recommend all those who are interested in the subjects treated of to purchase a copy of the work, as they will find it well worth the money expended on it.

Index to the Journals of the Society of Telegraph Engineers and of Electricians. Compiled by A. J. Frost.

When we find the name of Mr. A. J. Frost connected with a work of the kind in question we may be sure that the production will be thoroughly well done. The indexing of a work is by no means a light task if properly carried out, but we think that it is a task of a most useful character, and the compiler in the present case certainly deserves every credit for what he has effected. The index of the society's Journals is practically a record of electrical progress during the last decade.

Journal of the Society of Telegraph Engineers. No. 42.

The volume of this Journal just issued contains the following papers on "A Form of Battery of Low Internal Resistance," by F. Higgins; "Tests of Incandescent Lamps for Fall of Resistance with Increase of Electromotive Force, and Ratio of Candle-power to Work done on Lamp," by A. Jamieson; "On Attraction and Repulsion due to Sonorous Vibrations, and a Comparison of the Phenomena with those of Magnetism," by A. Stroh. The original communications are: "Report on Incandescent Lamps Exhibited at the International Exposition of Electricity, Paris, 1881" (communicated by W. Crookes, F.R.S.); "Shunts in Connection with Condensers," by W. F. Nosworthy; "On the Working of the Brown-Allan Cable Relay," by Henry C. Mance.

THE LAMPE SOLEIL.

In our issue of the 17th ult. we gave an illustrated description of this lamp, and we are now able to add still further to the information then published. During the week several of these lamps have been in action daily in the vaults under the Royal Exchange, the current being supplied by an auto-exciting alternating current "Gramme" machine. The absolute steadiness of this lamp is an accomplished fact, at least, as far as our observations of some hours extended. The "Sun" lamp is a very appropriate name for this invention, as the colour or rather the effect of the light more nearly approaches that of the sun than anything we have yet seen, and the impression produced upon the observer is a most happy one. The ordinary arc electric light is generally looked upon as a cold one in effect, and gives one more the idea of moonlight; but these objections vanish under the apparent warmth of the *Lampe Soleil.* To return to the arrangement of the lamps under the Royal Exchange. There are two rooms, supposed to represent respectively a drawing-room and reading-room. In the latter is a globe containing two lamps, partly concealed in flowers and inverted so as to throw the light in an upward direction, reflecting it downwards, and diffusing it at the same time. In the drawing-room are two globes suspended from the roof; one of these is of clear glass, the other slightly obscured, and each contains two lamps. The object of these double lamps will shortly be made apparent. In the engine-room was burning a naked lamp, and the current for these four lights was produced by a small alternating current Gramme machine. There are two double circuits from the machine, and each has two double lamps placed in it. We were informed, however, that the machine was capable of driving two more lamps if necessary. The reason of the double circuit and double lamp is this:—

We noticed in our former description that the *Lampe Soleil,* although its chances of extinction were slight, had not yet been practically arranged as a self-lighter, and that it would be necessary, in case of a lamp going out, to insert a fresh wick, or to automatically switch on a fresh circuit, for which purpose M. Macquaire has devised a self-acting commutator.

The installation under the Royal Exchange is not of a permanent character, nor are the lamps intended to be kept burning for a great length of time, therefore if any hitch should take place during the exhibition of the system, it is a very simple matter to switch on a fresh circuit and lamp in place of a faulty one, during which time the latter can be put in order again.

In actual lighting on a large scale, this arrangement would effect an exchange of lights in a precisely similar manner to the present method of employing the Jablochkoff candles. We do not suppose, however, that a complication of circuits will be carried out in practice, as a single lamp may be kept burning for a very long time, between 30 and 40 hours continuously. The diagram, fig. 2, will show the connections at present employed for working the *Lampe Soleil.* A wire from the machine goes on to the single block of the switch, and above this two wires are led to the globe, one for each lamp, L, L, a common return being used through a hollow coil, S. By plugging up either the right or left hand hole in the switch the current may be sent either into one or the other of the two lamps. We have for simplicity only shown one double lamp in the circuit, although, as before-mentioned, there are actually two. A core in the hollow coil moves an index arm over a scale graduated in ampères arrived at by comparison with a Siemens' electro-dynamometer. Should any accident happen to the circuit, this core would drop upon and short circuit the two springs underneath, which are attached to the two small terminals between which a battery and bell may be placed so as to give an alarm. A few days after the commencement of these experiments a second machine was set running to show the working of a very ingenious and simple form of self-lighting *Lampe Soleil*. The lamp is constructed for horizontal carbons which slide in the tubes, T, T, projecting from the ends of the lamp (fig. 1).

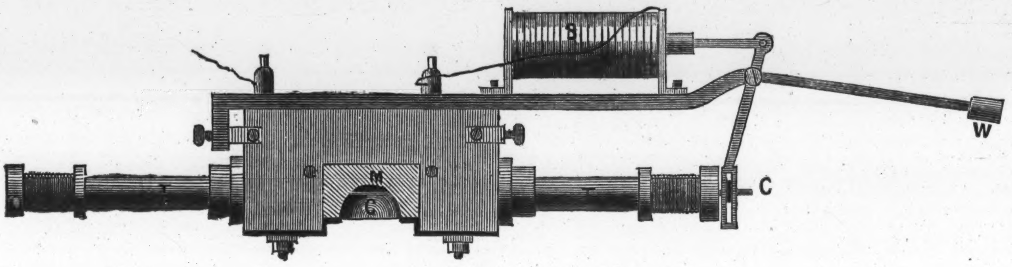


Fig. 1.

As the carbons consume they are pushed forward by the loosening of the spiral springs encircling the tubes, the movable shoulders to which one end of the respective springs are attached being allowed to slide in a groove cut in the sides of the tubes. The ends of the carbons come to rest at each side of the cavity cut in the marble block M. One of these carbons is hollow, and passing through it is a small carbon pencil, C, which reaches across the chamber in the marble and touches the other carbon. On the top of the lamp is a solenoid, S, whose core in its normal state is pulled nearly out by the weight, W, at the end of a pivoted lever. When a current passes through the apparatus the core is drawn inside the solenoid and the lever lifted, which in its turn draws out to a certain distance the carbon pencil C. Of course directly the small carbon breaks away from the end of the large one an arc is formed, which follows the withdrawal of the pencil until it reaches the end of the large hollow carbon. The lamp then continues burning, the carbons being pushed forward as consumed.

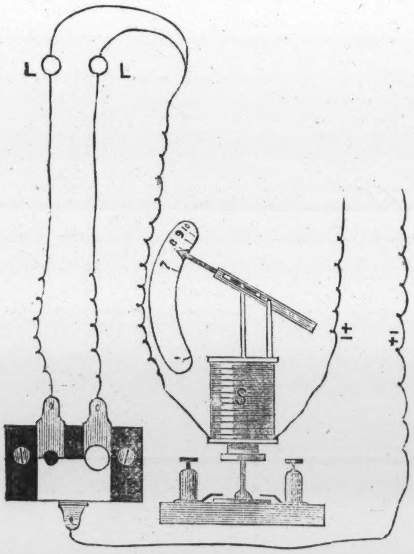


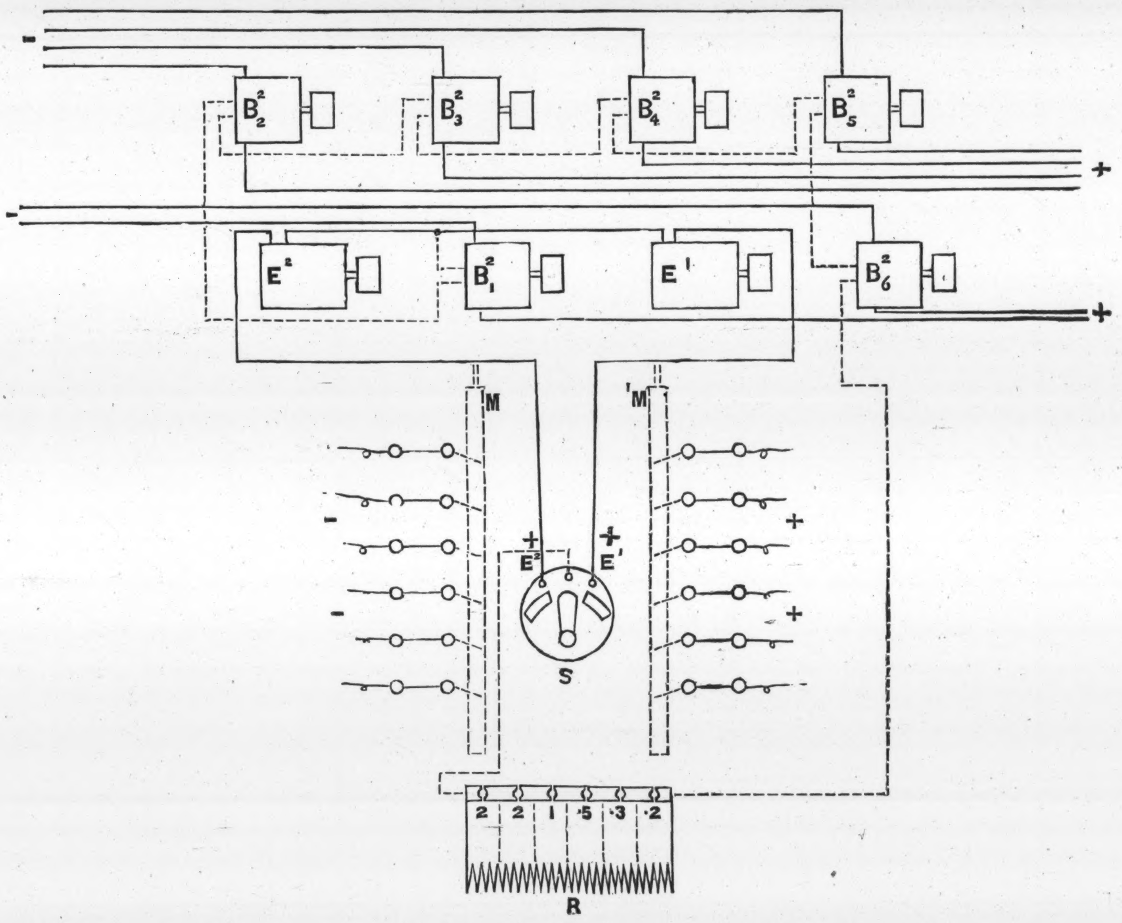
Fig. 2.

The simplicity and ingenuity of this automatic apparatus is worthy of recommendation, and we certainly think that by its employment the *Lampe Soleil* will make a great advance, looking at the matter from a practical point of view. In regard to the lamp itself, it is, without doubt, the most simple we have ever had the good fortune to witness in operation. Its cost, if made in numbers, could not exceed a few shillings, and there is apparently nothing in its construction liable to derangement. There is an entire absence of mechanism if we except the self-lighting part of the lamp, which, in itself, does not appear at all likely to get out of order. We witnessed a number of extinctions and re-ignitions of the lamp, and in no case did a hitch of any kind occur. The cost of carbons, which constitutes a very important item in ordinary arc lamps, is here apparently reduced to a fraction of the usual expenditure. It is evident again that the carbon employed need not be of the same purity as that necessary for other systems, as disturbances, which would make very sensible variations in the light emitted by arc lamps of the usual type, are, in the *Lampe Soleil* eliminated, or compensated for, by the incandescent marble. Whether it is as economical a lamp as others better known—that is to say, whether for a given strength of current produced by the absorption in a dynamo-electric machine of a given amount of horse-power, we could get in return as much light from this lamp as from an ordinary arc without the intervention of marble blocks, we cannot definitely state, until we are at liberty to publish certain tests which have recently been taken in London. However, even supposing its economy on this point is somewhat lower than the present systems of arc lighting, and we have good reasons for believing that it is not, it has numerous compensating advantages over its rivals. We shall look with interest to the future of this lamp, for although we were not favourably impressed with its performance during the late Electrical Exhibition in Paris—perhaps not a good place for judging the capabilities of any system exhibited—we have now had a better opportunity of studying its various points of merit, with the result of materially strengthening our present conviction that this lamp is destined to take a very high rank indeed in the electric lighting systems.

THE ELECTRIC LIGHT AT STAFFORD HOUSE.

This installation of electric lighting by incandescence on a large scale was briefly noticed by us last week, and we are now in a position to place before our readers a more detailed account of the machines and lamps employed for the purpose. This experiment, which we should be glad to see finally adopted, has been carried out in a very complete manner by the British Electric Light Company, under the supervision of Mr. W. Mackie, who will be well remembered as the representative in charge of the exhibit of the above-named Company at the recent Electrical Exhibition in Paris. The machine-room, which is at the back of Stafford House, is well planned, and Mr. Mackie may be congratulated on having effected a most substantial fixing for the eight Gramme continuous current machines, and the counter-shafting there running. Six of these machines, producing the current for the lamps, are of the "B^2" type, and their electro-magnets are fed by the current produced from an "E" machine, another similar one being in reserve and running free in case of an emergency.

We are informed that the resistance of the bobbin of a "B^2" machine is 0·4 ohm, and that of the electro-magnets 1·5 ohms. The difference of potential between the terminals of the machine when its electro-magnets are fed from another source, is about 150 volts when working at its best. The negative wire from each of the "B^2" machines is taken to a separate terminal, as shown in the diagram and marked —. These six terminals are respectively connected, by means of thick copper rods, to six others, and these are all jointly connected on the main negative cable, M. The positive wires from each machine are carried to a series of terminals in a similar manner, and then jointly connected on to the main positive cable, M^1.



It will be seen therefore that the six machines are joined quantitatively on to the main cables. The terminals are all fixed upon a large mahogany board, and the reason for making two sets of positive and negative terminals respectively, is to afford a ready and simple means of disconnecting any machine if necessary, by simply throwing out the thick copper rod which connects one terminal with its neighbour. The six machines, it is said, are not working up to their maximum power by any means, so that two of them might be thrown out of circuit, leaving the remaining four to carry on the full work. One lead of the exciting machine, E^2, say the positive, is brought on to the left hand terminal of the switch, S, the similar lead of E^1, being brought on to the right hand terminal of S. The remaining wires (negatives) of each exciter, are joined together and connected to the electro-magnets of $B^2(1)$, from thence to $B^2(2)$, and so on through the rest, the wire then going on to the slabs of the resistance, R, and finally to the middle terminal of S, which is attached to the lever. The exciting circuit is shown clearly by the dotted lines in the diagram. If the lever of the switch is turned to the left, then E^2 is in circuit through the electro-magnets of the machines, but if turned to the right, E^2 is cut out and E^1 put in. This switch is so constructed that the fixed contact slabs are slightly excentric to the curve traversed by the motion of the lever, so that in breaking contact sparking only occurs at the extreme corners of the lever and contact slabs. The resistance, R, which is made up of 2, 2, 1, ·5, ·3, ·2 ohms, is employed to regulate the magnetism in the electro-magnets of the B^2 machines, and therefore the amount of current produced. The main cables are made up of a strand of 19 No. 12 B.W.G. copper wires. These are carried up outside the house to the top, where they come through, and smaller branch wires are carried to the rooms in which the incandescent lamps are placed. In the banqueting room are two ornamental brackets containing six of the British electric incandescent lamps in each, a massive and elaborate chandelier, carrying 37 lamps, and six vases, each containing four, making in all a total of 73 incandescent lamps in this room. In the picture gallery are two chandeliers, one at each end, containing each 28 lamps. In the middle is the elegant looking chandelier, which was shown by the British Electric Light Company at the Crystal Palace Exhibition, and carrying 42 lamps. There are besides four tall ornamental standards, on which are placed lamps to the extent of 15 in each. Also four vases of seven lamps each, and two of eight each, together with four wall brackets supporting each two lamps. This makes a total of 210 lamps in the picture gallery. Those in the vases and wall brackets will, however, probably be moved from their present position, which is too close to the pictures. In and about the machine room are nine lamps, and the number now placed, including everything is, we are informed, 295.

The engine employed to produce the motive power is one of Marshall's portable type, 20 horse-power nominal. The indicated horse-power necessary to work this large private installation of the electric light is probably double, but we have no correct figures on this point. A few details with which we have been favoured may be of interest. A Gramme machine of the B^2 type produces a current of 50 ampères through an external resistance of 3 ohms. The resistance of the British electric incandescent lamp when cold is 150 ohms; when heated to produce 20 candle-power, 80 to 83 ohms. The total external resistance of the circuit at Stafford House, all the lamps being in multiple arc and at 20 candle-power, is about 0·3 ohms.

In our note on this subject last week a typographical error made it appear that it would be dangerous to come in contact with the wires; this, it will be well understood, is not the case, and the sentence should have read, "The guests were shown that there was *no* danger from coming in contact with the wires."

The running of the machines is very smooth and regular, and the whole installation is a good specimen of substantial workmanship effectively carried out. The British Electric Light Company does not advertise its wares very prominently, but it appears to be doing a considerable amount of work in a quiet sort of way, and we trust that the installation of its system at Stafford House may be the forerunner of a prosperous business in the future. We have had occasion to make some remarks on its failures in the past; we now hope to have nothing to describe but its successes.

PROCEEDINGS OF SOCIETIES.

PHYSICAL SOCIETY.—JUNE 24th.

Prof. CLIFTON, President, in the Chair.

New Members—Prof. BARTHOLOMEW PRICE, Principal VIRIAMU JONES.

Prof. G. CAREY FOSTER moved a vote of thanks to Prof. CLIFTON for the excellent reception accorded to the Physical Society at Oxford on the preceding Saturday, and drew attention to the high efficiency of the Clarendon Laboratory and the admirable provision made for the teaching of physics at Oxford.

Prof. W. G. ADAMS seconded the motion and endorsed Prof. FOSTER'S views of the position of physical science on the Isis.

Prof. CLIFTON, in response to the vote, stated that the University of Oxford had liberally supported him in organising the Clarendon Laboratory, giving him all the funds he required, and showing a laudable desire to put physical teaching on the best possible footing in Oxford.

Prof. C. A. BJERKNES, of Christiania, was then introduced to the meeting and, assisted by his son, delivered a lecture on "Hydrodynamic Analogies to the Phenomena of Electricity and Magnetism," which was illustrated by experiments and projections on the screen. Prof. BJERKNES has been engaged in tracing these analogies for the last twenty-five years; at first mathematically, but latterly by experiments in verification of the deductions from his formulæ. These experiments were shown in the Paris Electrical Exhibition last year, and have been published repeatedly in this country. Dr. BJERKNES has, however, advanced beyond the results there shown. These were chiefly confined to illustrating the static attractions and repulsions of electricity and magnetism; but he has now taken up the subject of electro-dynamic attractions and repulsions. The former effects are shown by brass balls oscillating, or by small tambours pulsating, near each other in water. These motions are communicated to the balls and drums by pulses of air, transmitted from an ingenious air-pump or bellows along india-rubber tubes. A pulsating drum corresponds to a magnetic pole; an oscillating body to a magnet. When two tambours are vibrating near each other in like phase they attract, when in unlike phase they repel each other. The same holds true of the oscillating balls. The stream lines round these bodies correspond to the lines of force round magnets. All the phenomena of magnetic forces were illustrated in this way by Prof. BJERKNES, including diamagnetism. The more novel part of the experiments consisted in representing the attraction between two electric currents flowing in the same direction, by means of two cylinders, about five inches long and one inch in diameter, oscillating round their longitudinal axes at close quarters in the water. The cylinders were oscillated by means of a pulsating tambour, which communicated its motion to them by a toothed gearing on their ends. Attraction resulted when the oscillations of the cylinders were opposed to each other, and repulsion when they were in the same direction. This is an inversion of what might have been expected to take place after the theory of Ampère. A square of four oscillating cylinders was also formed and a fifth cylinder oscillated inside it, the attraction or repulsion exerted on the latter being observed. A hydrodynamic galvanometer was made by placing an oscillating ball (which corresponds to a magnet) beside an oscillating cylinder, the result being a deflection of the ball according to the direction of the oscillation of the cylinder. The experiments were witnessed by a full meeting, which accorded a hearty vote of thanks to Dr. Bjerknes.

A paper by Dr. C. R. ALDER WRIGHT, F.R.S., was taken as read. It was on "The Determination of Chemical Affinity in terms of Electromotive Force" (Part VI.), and on the relations between the electromotive force in cells constructed like Daniell's cell, but containing different metals, and the chemical affinities involved in their actions. The cells employed were constructed of cadmium and copper and their sulphates, zinc and cadmium and their sulphates, zinc and silver and their sulphates, cadmium and silver and their sulphates, copper and silver and their sulphates. In all cases the sulphate solutions were of equal molecular strengths. The general result is that the effect of a given alteration in the character of the plates opposed to cadmium or silver was found to be practically identical with that of the same alteration in the case of a Daniell cell. Volta's law of the summation of electromotive forces sensibly holds true in the cases examined. These cells also behave like a Daniell under variations of current density.

The Society meets again in November.

CORRESPONDENCE.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer, not necessarily for publication, but as a guarantee of good faith.

Correspondence should arrive not later than Tuesday morning if it is desired to appear in the following number.

THE CANDLE-POWER OF ELECTRIC LAMPS.

To the Editors of THE ELECTRICAL REVIEW.

SIRS,—Your correspondent "Mathetes," in his letter which appeared in your last issue, fails to comprehend the reason why there is such a difference of opinion with regard to the candle-power of the Brush arc lamps. The reason is, simply, that the opponents and rivals of the above system are naturally trying to run it down as much as possible, by saying the lights referred to are not more than a few hundred candles, although the highest scientific authorities have proved that the light actually given out by the Brush lamp is equal in intensity to 2,000 sperm candles. This I proved for myself, experimentally, using the ordinary Bunsen's photometer, the following being the results:—

In front of the lamp, at an angle of 40°.

Candles.
Intensity of light without globe ... ... = 2,025
,, ,, with ,, ... = 1,074

On one side of the lamp, at an angle of 30°.

Candles.
Intensity of light without globe ... ... = 2,018
,, ,, with ,, ... = 900

Your correspondent does not seem to know that the candle-power of any light of unknown intensity is measured by comparing it with a standard candle (*i.e.*, a sperm candle consuming 120 grains per hour).

He also cannot understand how the Siemens small lights were nominated 300 candles, and those of the Brush 2,000.

One reason is, that the opal globes used for the Siemens were clearer than those used for the latter, and consequently did not absorb so much of the light in proportion, the other reason being that the candle-power of these lights, I believe, was rather underrated (I see in an account of the electric lighting at Hull they are called 350 candle-power), or at any rate the term 300 candle-power signified the intensity of the light surrounded with an opal globe, the reason being, in fact, to compare most favourably with the Brush lights in this respect, as they could not in cost.

I would ask your correspondent, did he compare the Siemens large lights (6,000 candle-power) with the small ones, if so, would he have thought the former to be *twenty times* as powerful as the latter?

Most of your correspondents seem to imply that the Brush lamps ought to be nominated as regards their candle-power, as seen burning in the streets (*i.e.*, surrounded with an opal globe), if so, I fail to comprehend the reason why the Brush lights should be the only ones subject to so much criticism. Are the larger lights of Siemens, Brockie, or Crompton, 6,000 candle-power, as seen burning in the streets?

Yours faithfully,

R. L. C.

To the Editors of THE ELECTRICAL REVIEW.

SIRS,—Mr. Phillips, the able electrician to the Brush Electric Light Company, in his letter which appeared in your columns of June 10th, states that Messrs. Ayrton and Perry have certified that the Brush arc lamp is equal to 2,000 candles. It appears to me, and I hope you will concur in the opinion, that the time has arrived when the true meaning of these definitions should be made known to the public.

I have observed that, as a rule, the Brush arc lamp is constructed to burn carbons of eleven mm. in diameter. Now the first question that occurs is this: Can the useful effective light be increased by a greater quantity or intensity of electromotive force? and if so is there any standard of comparison to show the relative proportions of power to light produced? Perhaps Mr. Phillips will be good enough in your next impression to send a copy of Messrs. Ayrton and Perry's certificate above referred to. The next question upon which the public requires the fullest information is the true meaning of candle-power; for instance, in any given building which is sufficiently and properly lighted by the distributed and diffused light of 2,000 standard sperm candles, is it pretended that the Brush arc light, alleged to be of 2,000 candle-power, will give the same volume of useful light and equally and as uniformly distributed? From comparisons which I have seen between gas and the electric light, notably in the case of the Lord President's Court at South Kensington, which I think every impartial person must admit is not nearly so well lighted by the sixteen Brush arc lights as it was by the gas. I am bound to assume that the Brush arc light is not equal in its useful effect to 2,000 candles. What the public want is a statement of the true useful equivalent of any given arc lamp.

I am, Sirs, your obedient servant,

AMATEUR.

June 21st, 1882.

COUNT DU MONCEL'S HISTORY OF THE TELEPHONE.

To the Editors of THE ELECTRICAL REVIEW.

SIRS,—The Count du Moncel, in his criticisms upon Professor Dolbear's Memoir on the Telephone, takes exception to a statement of mine originally made in a letter to the *Times* and reprinted in THE ELECTRICAL REVIEW of May 27th, alleging that, contrary to what I have said, the judgment recently delivered in England "is perfectly clear as regards the Reiss receiver." I do not think that I have said anything to the contrary, the judgment of Mr. Justice Fry was perfectly clear on that point, and I challenge M. du Moncel to produce any words of mine contrary to this effect. I have written none. In that judgment no doubt is expressed that Reiss's receivers, of both patterns, the knitting-needle receiver as well as the electro-magnetic receiver, are capable of acting as receivers. Both of them will speak if proper currents are transmitted to them. But the judge has ruled that as they do not contain "a plate capable of inductive action," they act on a different principle from Bell's receiver, and therefore do not anticipate Bell's invention. As to the fact that Reiss's receivers will receive, I have therefore no cause to take a contrary view to Mr. Justice Fry's judgment in which that fact is tacitly admitted to be true. What I have, however, maintained in the passage to which Count du Moncel refers is that Reiss's *transmitters* will *transmit*, and on that point I did venture to criticise the judgment, because it is clear that the learned judge had not quite understood—perhaps for want of having it set properly before him—what the Reiss transmitter was intended to do, and what it actually did. The learned judge regarded the transmission of speech by Reiss's telephone as a mere accident occurring during singing, for he said that Reiss's telephones of 1863 were found "occasionally and uncertainly to reproduce vocal sounds *with* musical ones." Now I do not want to bias or complicate the question by speaking of what Reiss's instruments can be made to do *now*. We all know that with proper precautions they can transmit low speech perfectly, but I prefer entirely to pass that by and ask what they would do before 1876. In Reiss's original communication to the Physical Society of Frankfort, dated December, 1861, and whilst his transmitter was more rude in form than either of the two later instruments that have been commonly referred to as "Reiss's transmitters," he says: "*It has not until now been possible to reproduce the tone-speech of men with sufficient distinctness for each. The consonants are mostly tolerably distinctly reproduced, but the vowels not as yet in equal degree*;" and he goes on to give a theory of his own why this should be, based upon the fact that the reproduced sounds are (as in all telephones) feebler than the original tones. This quotation proves that at the very beginning of his researches Reiss not only intended his instrument to transmit speech, but that he had succeeded sufficiently to announce the fact, and that such transmission of speech was wholly independent of the transmission of musical tones. It was not that you "thought you heard the words" of a song, nor was it, as an eminent engineer stated, that "when singing a note a sort of word was occasionally projected along with it." I pass on to Reiss's transmitter of the form described in Legat's Report of 1863, in the journal of the Austro-German Telegraphic Association. Legat merely says that with lecturing and speaking single words were indistinctly perceptible. Kühn, who, in Kartsten's "Universal Cyclopædia" (published in 1866), gives figures of both the later forms of Reiss's telephone, says that the square pattern transmitter did not reproduce speech well, but yielded only an indistinguishable noise. He doubtless spoke too loud. Pisko, who, in 1865 described this same form of transmitter in his book on modern acoustic apparatus, on page 95 of his work, speaks of the Reiss telephone as intended for speaking; but says that when he first experimented with it he could get out only the rhythm of the words sung or spoken into the transmitter, and that the apparatus, though a "telephone," was not a "phonic telegraph." In the succeeding pages he, however, gives the results of later experiments, declaring that every condensation of the air in the mouthpiece affects the membrane, and that membranes can vibrate in unison with every kind of tone, as is proved by the action of the tympanic membrane of the ear. Reiss had himself maintained the same view, and indeed was led to construct his telephone by a study of the action of the ear.

Further than this, we find in Pisko's book, p. 241, a copy of the prospectus written in August, 1863, by Reiss to accompany his telephones, and which was sent out in printed form by the maker, Albert, of Frankfort. Reiss says in this document: "Besides the human voice, according to my experience, the tones of good organ-pipes, from F to C''' (in pitch), and those of the piano, can be reproduced equally well." In this prospectus, also, there is an explanation of the action of the signal-"call" affixed to the side of the transmitter and worked by a key at the receiving end. The instructions for using this signal-call are: One tap = "sing"; two taps = "speak." Can any one doubt that Reiss intended his instrument to transmit speech, when such directions stand printed in his own prospectus? In Dingler's *Polytechniches Journal* for 1863, p. 29, occurs the following sentence: "Melodies can be reproduced with astonishing certainty, whilst single words in reading, speaking, &c., were less distinct, although the peculiar modulations of the voice in speaking, calling, interrogation, surprise, or command, were clearly marked." These things, to say nothing of the testimony of contemporary witnesses, or of the experiments of Yeates in 1865, must be absolutely convincing as to what the Reiss instrument accomplished. The Count du Moncel is unjust in classifying the Reiss instrument as a mere "tone-telephone." He is still more unjust—nay, incorrect in facts—in saying that the invention of Reiss "*only admitted of the transmission of musical sounds.*" This is not the way to write impartial history: first to discredit the facts with a question-begging epithet, and then to deny them altogether.

On another question of fact the Count is equally unfortunate. "It is certain," he says, "in our opinion, that the interrupter of Reiss has never produced undulatory currents." The Count forgets that in Reiss's principle of *loose-contact* we have all the requisite elements for regulating the strength of the current by variations of resistance according to the goodness or badness of the contact. Imperfect contact is the basis of all the devices which Edison christened "tension-regulators"; and in Reiss's instrument we have a loose-contact regulator combined with a tympanum. That such an arrangement *does* set up undulatory currents is proved by the fact that it can be made to transmit speech. A Blake transmitter, in which the carbon-platinum contact is replaced by two silver buttons, will transmit speech as perfectly as before. Yet, according to the Count's way of looking at things, an interrupter, consisting of two silver buttons resting loosely against one another, ought to be incapable of transmitting human speech. The facts are unfortunately the other way. When M. du Moncel says *it is certain*, in his opinion, that the Reiss interrupter has *never* produced undulatory currents, he forgets, firstly, how extremely difficult it would be to prove such a mere negative statement; and secondly, that it only proves that M. du Moncel's opinion is not to be always relied on.

Perhaps, before the next edition of "Le Téléphone" is called for, he will do the memory of the humble German inventor of the telephone the justice to read what he really accomplished. Perhaps, also, M. du Moncel will do another German the justice to recognise his work. The magneto-electric telephone of Dr. T. Clemens, which worked at Frankfort-am-Main in 1863, is surely as deserving of notice by a historian as are the barren guesses of M. Bourseul, to which the Count du Moncel gives so much prominence.

SILVANUS P. THOMPSON.

DYNAMO-ELECTRIC MACHINES.

To the Editors of THE ELECTRICAL REVIEW.

SIRS,—The ELECTRICAL REVIEW of June 24th, containing the published specification of Mr. H. F. Joel's magneto-electric machine, 4607, October 21st, compels me, in justice to myself, to send you the enclosed photo of one I made over two years since, and which has been in work more or less ever since, and also on view in due form, for that time.

I showed Mr. Frost, the Librarian of the Society of Telegraphic Engineers, 4, Broad Sanctuary, Westminster, a copy of the enclosed soon after the library was open to the public. I also explained the construction of my machine, with a sketch, to Mr. Crampton (?), Mansion House Buildings, early in this year. I think each of these gentlemen would recognise it should you think the machine worthy to figure in your work, which has so ably defended the rights of all.

You will see that the description of Mr. Joel's base-plate, A, four upright electro-magnets, *c*, are mounted, braced on the top with a plate, arranged in pairs, coiled to make the poles the same, &c., and with extending pole-plates, as the perspective view will show. I have pleasure in leaving the justice of this with you,

And remain,
Your humble servant,
JOHN S. RILEY.

Riddings, Alfreton, Derbyshire,
June 26th, 1882.

[We thank our correspondent for his letter, but we fail to see any resemblance between the machines of Joel and Riley, except in the fact, that in one form of machine they both employ four upright magnets. Mr. Riley may probably be aware that the original form of the "Gramme" machine had six upright magnets fixed to an iron base, and braced across the top with an iron plate, as shown in his photograph. The three on one side were coiled so as to produce north polarity in the pole pieces, the remaining three the reverse.—EDS. ELEC. REV.]

THE TELEPHONE IN SCOTLAND.

To the Editors of THE ELECTRICAL REVIEW.

SIRS,—Allow me to correct the paragraph in last number of the Review, page 467, headed "The Telephone in Scotland," in so far as the "forty new subscribers" is the "reward of unwearied perseverance." The facts are as follows:—There has been a local telephone company in Dundee for the last two years, having over 200 subscribers, who pay at the rate of £10 yearly. The National Company having failed to get subscribers at their ordinary fixed rate, or by fair competition, are now offering and *giving* to the local company's subscribers their telephones free of charge until their lease with the said local company expires, and thereafter at the rate of £5 yearly for five years. To all others the rate is to be the same so long as the local company exists—a rate which it need hardly be said will not "contribute to a speedy return of present outlay."

I am, Sirs, yours obediently,
G. LOWDON,
Dundee, *June 27th*, 1882. ELECTRICIAN.

DYNAMICAL AND STATICAL ELECTRICITY.

To the Editors of THE ELECTRICAL REVIEW.

SIRS,—In your issue of June 24th, p. 469, is a graphic description of a new lamp for the production of electric light, invented by Sydney Pitt, and communicated by Lucien Gaulard and John Dixon Gibbs. Permit me to ask for the following information respecting the working of the lamp:—(1) Does the entire current pass through the induction coil, or only the static form of the force? (2) If the entire current passes through the induction coil, is only the static force eliminated, and does the dynamic force alone proceed through the carbon, producing incandescence? (3) Is the strength of the current in ampères not reduced by the introduction of the induction coil, and if so, does not that diminish the incandescence of the carbon thread? (4) Do the sparks from the static current materially increase the illuminating power of the lamp, and if not, what is the value of the new arrangement? I am, &c.,

T. P. BARKAS.

Newcastle-on-Tyne, *June 26th*, 1882.

[In answer to our correspondent's queries, the lamp, as we understand it, acts as follows:—The current from a dynamo-electric machine (alternating current) passes through the *primary* wire of the induction coil, and through the carbon filament direct, producing incandescence. The induced currents in the *secondary* wire of the coil, produced by the reversals of current in the primary, are allowed to spark across the two platinum points close to the filament. We do not see any advantage in this arrangement, and our correspondent is quite right in assuming that the strength of the current is reduced, as far as the incandescence of the carbon filament is concerned, by the introduction of the induction coil. We cannot imagine the sparks materially increasing the illuminating power of the lamp.—EDS. ELEC. REV.]

NOTES.

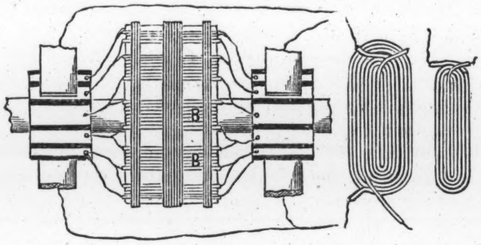
NOTICE TO OUR CORRESPONDENTS.—It has recently come to our knowledge that a considerable number of private letters addressed by us to our friends and correspondents have not, for reasons now known, arrived at their respective destinations. We shall therefore be glad to hear again from any who, either at home or abroad, have been fruitlessly awaiting answers from us.

ELECTRICAL DISCOVERIES.—A fresh Volta prize of 50,000 frs. has been created by the French Academy of Sciences for the most remarkable discovery in electricity during the next five years. The competition will close on the 31st of July, 1887.

THE BRUSH ELECTRIC LIGHT IN FRANCE.—The municipality of Marseilles have decided to continue the trials of electric lighting made by the gas company in the Place de Castellane, and to undertake further experiments on a larger scale. The intention is to light, from eight o'clock in the evening till midnight, the Cannebière and the Rue de Noailles by means of 22 lamps, equivalent to 924 Carcel lamps. The lamps will be of the Brush system. The cost of erecting the machines, &c., will be about £4,800, but the company asks the town to pay part of these expenses, calculated at the rate of 7½d. per hour. According to these calculations, the number of hours will be 1,889, equal to about £1,250, from which sum should be deducted the cost of the economised gas, amounting to £180. The sum to be paid, therefore, by the town would be about £1,070. This idea has been accepted by the municipal counsel, and the first trial will take place on the occasion of the festivities of the 14th inst.—*La Lumière Electrique.*

DYNAMO-ELECTRIC MACHINE. — Patent No. 259,077. Filed in the United States of America Patent Office, February 25th, 1882.—By Chas. E. Ball.

Brief.—Forms the cores of the armature of coils of insulated iron wire and winds coils of insulated copper wire upon them, the winding being parallel with the axis of the machine. The terminals of these coils are taken out at opposite ends of the armature and connected with separate commutators.



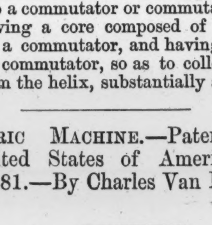
Claim.—1. An armature for dynamo-electric machines, comprising a core composed of bobbins of iron wire and an external helix or wrapping of copper wire, the wire of both the core and the helix being wound in a direction parallel with the axis on which they revolve, substantially as described.

2. A compound bobbin consisting of an internal bobbin of iron wire and an external bobbin of copper wire surrounding the internal bobbin, both said bobbins being wound in a direction at right angles to the direction of revolution, and having their terminals taken out at opposite sides of the armature, substantially as described and shown.

3. An armature composed of a cylinder of wood or other non-conducting material, and having secured thereto, substantially as set forth, a series of compound bobbins, each compound bobbin consisting of an internal or core bobbin of insulated iron wire and an external surrounding bobbin of insulated copper wire, both said bobbins having the wires of which they are composed wound in a direction at right angles to the direction of the revolution of the said armature, the ends of the bobbins being respectively connected as set forth—*i.e.*, the iron bobbins in one series and the copper bobbins in another series, both leading to a commutator or commutators, as set forth.

4. An armature having a core composed of a magnetic material which is connected to a commutator, and having a surrounding helix connected to another commutator, so as to collect separate currents from the core and from the helix, substantially as set forth.

DYNAMO-ELECTRIC MACHINE.—Patent, No. 259,061. Filed in the United States of America Patent Office, December 15th, 1881.—By Charles Van Depoele.



Brief.—The armature sections are formed of plates of sheet-iron bent upon themselves, the conducting wire being in layers alternating with the plates. Plates of sheet-iron are fastened to the sections to form the polar extremities of the sections and to afford means of attachment to the supporting discs. Each armature coil is connected at one end to a ring which is common to all, the other terminal of each coil being connected to a commutator plate.

Claim.—1. In an armature, a series of sectional cores, each composed of thin sheet-iron plates folded upon themselves, in combination with layers of wire wound between said metal plates, substantially as described.

2. In an armature for a dynamo-electric machine, a magnetic section consisting of a sheet-iron core bent or doubled upon itself and secured to pole-faces of the same material and coils of wire wound upon said core, substantially as described.

3. Pole-faces, in combination with the bent sheet-iron cores, *b*, forming supports for the layers of wire forming the magnet-coil, substantially as described.

4. The combination, with the pole-faces, having projecting ends, of the alternate bent sheet-iron cores, *b*, and layers of wires secured between said pole-faces, the discs, B, having recesses to receive the ends of said pole-faces and rods and nuts, substantially as described.

COST OF THE ELECTRIC LIGHT.—The *Warehouseman and Draper's Trade Journal* gives some particulars of the cost of the electric light in a private establishment—that of Messrs. Samuel Brothers, of Ludgate Hill. The dynamo machine is worked by an Otto gas-engine of 12 horse-power, which is, however, far in excess of what is required for the existing lights, and will be amply sufficient for a number of incandescent lamps which are about to be fitted up in the counting-house, private office, and fitting-rooms. The engine and lamps require no skilled superintendence, and are attended to by the head porter. There are altogether 20 Jablochkoff arc lights, five of which are in front and the remainder are employed to light up 4,000 square feet of space inside. Each lamp has an illuminating power of 378 candles, equal to 35 ordinary gas-burners, as verified by the scientific staff of the Metropolitan Board of Works. The Jablochkoff "candles" cost for each lamp 1d. per hour, and the gas consumed by the Otto engine costs also 1d. per lamp per hour. The total expense per annum is £150, the lighting of the premises averaging three hours each night.

DUNDEE GAS COMMISSIONERS AND THE ELECTRIC LIGHT.—At the annual meeting of the Dundee Gas Commissioners, held last week, it was stated that, in view of the progress of the electric light, it had been deemed advisable to increase the sinking fund, so as to pay all the annuities in thirty years. It was agreed to apply the surplus, which was sufficient to allow a reduction of 3d. per 1,000 feet, to the sinking fund and the improving of the quality of the gas.

MUGGINS'S BRITISH - AMERICAN BROOM COMPANY (LIMITED).—In our issue of the 10th ult. we reprinted a letter which appeared in the *City Press* with the above heading. In the same paper of last Wednesday appears the following amusing continuation of the subject:—

TO THE EDITOR OF THE "CITY PRESS."

SIR,—I have been subjected to an amount of abuse in connection with my letter to you on the above matter that perfectly astonishes me. The dearest friend I have on earth, to whom I owe many obligations, including one at three months for 75*l.*, writes to ask me why, if I wanted to insult as well as ruin him, I could not have taken some more manly method! He declared that I must have known that he is a director of a company, and that my Broom company is a satire upon his company. In vain I plead entire ignorance of the whole matter, he declares the two companies are absolutely identical in every respect, except that my brooms are imaginary, while his other things are realities. So much so, that while previous to last week they were rising rapidly to a large comfortable premium, they have, since the appearance of that diabolical letter, been gradually sinking to a small but prophetic discount. He goes on to say that his juvenile company has paid a large sum for permission to use something, of the cost of which he and his co-directors are entirely ignorant, and when I replied, quite naturally, as I thought, "More fools you," he flew into a violent passion, and bounced out of the room. He has since written to say that he supposes I shall have the audacity to plead ignorance of the reason why my friend has selected Spain for his tour, and recommends me to join him as soon as possible, Spain being the one place, within reasonable distance, where, there being no extradition treaty, swindlers are quite safe.—I am, &c.,

AN OUTSIDER.

THE CHANNEL TUNNEL WORKS. — It is stated that within the last week the electric light has been re-established in the tunnel, the apparatus having undergone repair.

MUCH ADO ABOUT NOTHING.—It is of course very well known that various journals of a non-scientific nature, and one or two others having some pretensions beyond that of general information, have countenanced the system of *division* and *sub-division* which is claimed as an invention by Mr. J. B.

Rogers. The latest amusing addition to this subject, related however in a manner which is now getting rather familiar, we clip from the columns of a *weekly commercial, financial, industrial, and general City review*, which has recently devoted a considerable portion of its pages to matters relating to electricity.

> Mr. Rogers sends the current from his dynamo generators through a series of wires to boxes containing pairs of hollow copper globes, or other metallic forms. To one portion of these, clips are fixed, and through them communication is established with the primary wires, while a series of other clips connect wires for conducting the fluid to any desired number of lamps or carbons, or to other shaped vessels arranged in pairs from which again wires can be conducted to other lamps or carbons. It will be seen that Mr. Rogers thus obtains two large surfaces over which to connect his currents, and that a facility of division and subdivision is created which is most important for domestic lighting purposes. The contrivance is certainly as simple as it is ingenious, although the electricians appear to quarrel with Mr. Rogers for thus establishing what *they* call an accumulator, whilst it is nothing but a resting-place for the time being from which the electric current can be divided and subdivided.

Our contemporary being apparently a young beginner in the electrical world must not be treated harshly, and we will therefore recommend it in strict confidence to send a representative to the works of Mr. Rogers again, and ask that gentleman to take his *dividing boxes* away, and to fix the "wires conducting the fluid to any desired number of lamps" direct on to his primary wires, and to note the result.

The Electric Light at King's Lynn.—An introduction of the electric light has just been made into King's Lynn, at Messrs. Walker's mill. This contract has been carried out most successfully by the British Electric Light Company (Limited) with the "Gramme" machine and sixty-two "British" incandescent lamps. Messrs. Walker believe that the lighting will cost much less than they have hitherto paid for gas. A "Brockie" arc lamp of 6,000 candle-power was also suspended in the market-place and the adjoining thoroughfares. Large crowds assembled each night to view the new light, and seemed astonished at its power and brilliancy.

The Fyfe-Main Electric Lamp.—Six of these lamps are now employed for lighting parts of the new offices of the *Daily Telegraph*. We are informed that it is highly probable that this system will be largely extended over the rest of the building.

Underground Conductors for Powerful Currents.—We notice the following description of a new conductor for electric lighting purposes in the *Operator* :—

> A new form of underground main for conducting powerful currents, such as are used for electric lighting or for manufacturing and motive purposes, has recently been invented by a Detroit man. The main is extremely simple in construction, and is said to have many advantages over the only main in the field at present—the Edison main. The new main consists of a No. 6 copper wire, which is placed exactly in the centre of a copper or brass tube about $\frac{7}{8}$ inch in diameter, and 1-16th inch in thickness. The wire is insulated from the tube by means of an insulation consisting of a mortar or putty made of the most refractory sulphate of lime mixed with a heavy oil, and injected by means of heat into the tube. The copper tube is wound with kerite tape, and, being surrounded by a layer of the insulating material, is encased in a protecting pipe of iron—a common $1\frac{1}{2}$ inch gas-pipe. The main is intended to be made in sections of 12 to 15 ft., which connect with one another by means of screw-joints. When the end of the line is arrived at, a metal cap, insulated from the ground, is screwed on, thus closing the circuit. The main has at certain fixed points—for instance, every 1,000 feet—a box at which the circuit may be "short-circuited," in order to facilitate any repairs which in the course of human events may become necessary.

The Brush Electric Light in America.—Ninety-six of the 225 electric lamps, which are to be furnished by the Brush Electric Light Company to the City of Baltimore, were lighted last week for the first time. The lamps are on neat poles, 18 ft. high, with swinging globes, similar to those in private use, the poles being placed from 300 to 600 ft. apart. The lamps are a success, and general satisfaction is expressed.—*The Operator*.

The Edison Electric Light in Switzerland.—A large cornmill in Gillamont, near Vevey, in Switzerland, has been lighted with Edison's incandescent lamps. The owner of this mill, Mr. Roussy, is very pleased with them, and states that he can burn fifteen lamps of eight candles each per horse-power. Each of these lamps can supply, without deteriorating, a continuous light for an average of more than three hundred hours, and as he obtains the driving power from a waterfall he reckons that this kind of lighting does not cost him more than one farthing per hour per lamp, all expenses paid, including even the sums representing the interest on the plant. The works are lighted by means of 100 lamps of the type named by Mr. Edison half-lamps, and one single dynamo machine, without exciter, of the type described in our number of the 1st October, 1881, is sufficient to feed them all. To each of these lamps are further added several resistance coils, so as to be able to vary the power of their light with a range of from eight to three candles, because experience has taught that the work in the mill did not require a great lighting power. Every one in the works is pleased with this system of lighting, and others of the same kind are now being put up in different parts of Switzerland. It is certain that in proportion as this kind of lighting will spread, the selling price will decrease more especially that of the lamps, which at present are selling at six shillings, but before long may be sold at half that price. Admitting, then, that these lamps last 300 hours and that they have therefore to be renewed every two months, when burning five hours per day, the cost of these lamps will not be more than $1\frac{1}{4}$d. per day at the present prices.—*La Lumière Electrique*.

The Winding-up of the Scottish Brush and Electric Light and Power Company, Limited.—In the first Division of the Court of Session, Edinburgh, on the 22nd ult., the hearing of the petition of the Anglo-American Brush Electric Light Company, Limited, to have the Scottish Brush Electric Light and Power Company put into liquidation, was resumed, the Scottish Brush Electric Light Company was brought into existence, not so much with a view to do business itself, as a precursor and parent of another company, which was to be on more extensive lines, and to carry on business on a larger scale. This larger company has now been formed, and the petitioners seek to have the preliminary company wound up. Lord Deas said, that it appeared in the course of the discussion that no objection was made by the Scottish Brush Electric Light Company to its being wound up, but on the contrary the directors were themselves contemplating a voluntary liquidation. It was also apparent from the discussion that the whole question between parties was whether the liquidation should date from the 17th of May or from the 30th of June. All their Lordships concurred in refusing the prayer of the petition on the ground that the petition was premature, and that to grant it would give one set of shareholders an undue advantage over the other. The Court refrained from giving any opinion as to the legality of allotting shares in the Scottish Electric Light Company since the date of the presentation of the petition.

Telegraph Cable Interrupted.—Telegraphic communication with the Island of Mull is interrupted, the cable being broken near the Mull shore.

New Submarine Cable.—The Eastern Telegraph Company have obtained a firman authorising it to lay down a submarine cable between Malta and Tripoli.

The Postal Telegraphs Engineers' Department.—In the House of Commons on the evening of Thursday, the 24th ult., Mr. Arnold Morley asked the Postmaster-General whether it was proposed to apply to the Engineers' Department of the Post Office a scheme similar to that which was applied last year to the Commercial Department; and in the event of its being so proposed, if he could state whether the scheme had yet been approved, how soon it was expected, and whether it would date back to April of last year. Mr. Fawcett in reply said : I beg to state that the scheme is settled, and, under the special circumstances of the case, instructions have already been given for putting it in force from the 1st of April, 1881, so far as concerns that portion of the department which may be regarded as co-ordinate with the in-door branch of the telegraph service.

THE INDIA-RUBBER, GUTTA-PERCHA, AND TELEGRAPH WORKS COMPANY, LIMITED.—This company has received advice by telegram from their Engineer-in-Chief, Mr. Robert Kaye Gray, on board the steamship *Silvertown*, of the laying, on the 23rd ult., of the Buenaventura-Panama section of the Central and South-American Telegraph Company's submarine cable, by which that company's system is completed from Lima to Panama. The cable from Buenaventura was landed on the Island of Pedro Gonzales, in Panama Bay, and about forty nautical miles south-east from the town of Panama, and a branch line was then laid from this island to Panama.

The ss. *Silvertown* and the ss. *Retriever* are now laying the cable from Pedro Gonzales Island to Salinas Bay, in Costa Rica. Panama, therefore, is now connected with Lima, Peru, and so soon as these cables are opened for traffic, they will form a duplicate line of communication between the stations on the West Coast of South America and Europe.

ON FIRE PREVENTORS OR PYROSCOPES.—By M. A. Ledieu.—In the *Comptes Rendus* for June 6th, 1881, the author described a pyroscope based on the action of metallic pieces, embedded in a small board so as to increase considerably its conductivity for one and the same degree of moisture. There are, however, inconveniences in such an instrument, such as the weakening of its indications in consequence of the production of a secondary current in the board, and a rapid wearing away of the battery if it acts continuously with too much energy. After describing and criticising certain other arrangements he proceeds: We may imagine, for one and the same battery, two circuits, in each of which is intercalated a coil of equal resistance. One of the coils is placed in the locality to be protected. The second coil, as well as its circuit, is kept entirely outside the locality. The two circuits are then connected to one and the same galvanometer, so as to lead into the apparatus two extremely weak derived currents in opposite directions, but equal as long as the state of affairs remains normal. As soon as the temperature rises in the locality the coil inclosed there becomes more resisting, and then the battery acts with some degree of activity, setting the needle of the galvanometer in motion and announcing the rise of temperature, and setting a bell in action, when this temperature reaches a certain point. But this arrangement being costly, the following may be substituted:—

In a single circuit there is interposed a cylinder of a material which is at once insulating and not fragile. This cylinder is filled with a liquid which resists electrolysis, and has besides a good conductivity which increases with temperature. At each extremity of the cylinder there is a tightly-fitting plug, through which passes a platinum rheophore connected to one of the ends of the wire of the circuit cut in two. As the most suitable liquid the author proposes alcohol.—*Comptes Rendus.*

ON THE EFFECTS PRODUCED IN A VACUUM BY THE CURRENT OF THE GRAMME MACHINE.—MM. Jamin and G. Maneuvrier.—As soon as Davy had discovered the electric arc he reproduced it in a receiver exhausted of air in order to avoid the combustion of the carbons. He saw that the arc became larger, that carbonaceous matter was transported from the positive to the negative pole, and that the former was more luminous than the latter, but that the general aspect of the phenomenon was unchanged. Despretz repeated the experiment with a more powerful battery, and found that the carbon volatilised was deposited on the sides of the glass globes as soon as the intensity of the current exceeded a certain limit. It is possible that this deposit of carbon takes place in all cases, but is only observed when the intensity is very great.

The result is different when instead of a battery there is used a Ruhmkorff coil which, as is well known, produces successive induction currents in opposite directions. The whole action is reduced to almost instantaneous discharges, *i.e.*, sparks, separated by comparatively long intervals of rest, during which there is a luminous flow; but there is no arc, because the quantity is deficient.

The Gramme alternating current machine, along with special features of its own, participates in those of the battery and the coil. Its effects are those of batteries heightened by enormous tension and those of the coil, with the increase resulting from a greater quantity of electricity.

In the imperfect vacuum of an air-pump the results may be partly foreseen, and they are very curious.

Having taken an electric egg we placed in it opposite to each other two carbons, 0·15 metre in length by 4 millimetres in diameter, and separated from each other by an interval of 4 millimetres. When the vacuum reached about 12 millimetres the light begins to play not in the form of a very luminous arc concentrated between the points, but issuing from all parts of the carbons, with the ordinary aspect of the glow in a Geissler tube. Each of them showed at once the appearances which characterise the two poles with the coil, *i.e.*, the blue halo enfolding the surface of the two cylinders which belongs to the negative pole, and beyond, the paler stratified light due to the positive pole. All the globe is filled with light. The experiment is one of the finest that can be seen.

Thus the two currents contribute equally in producing a phenomenon which is like that of Geissler's tubes, but which has an incomparable lustre. The carbons are heated to whiteness and are rapidly volatilised by the combined effect of the temperature and the currents. A carbonaceous matter is diffused in the state of vapour. The globe is filled with a blue gas like the vapour of iodine, which darkens to an indigo colour. The vapours then condense upon the sides of the globe, rendering it opaque and putting an end to the experiment. The deposit, when collected, resembles finely divided carbon, and dissolves in nitric acid, with effervescence and incandescence. The authors purpose examining whether it is pure carbon or a compound of hydrogen and carbon.

The author then substituted for single carbons two bundles of parallel pencils, fitted to the two rheophores and placed in a diverging direction. In this case the currents divide into a great number of effluves less intense than the single effluve; all the carbons are illuminated at once and are heated the less as they are more numerous. The volatilisation is substantially null, and the experiment can be prolonged as long as is desired.

In another experiment, rods of copper 0·003 metre in diameter, and diverging from the rheophore were substituted for the carbons. The same effect is produced with still more splendour. If the current is too intense the copper melts. It is always volatilised in part and deposited in a slender layer over the globe. The experiment may be modified by using different metals, different gases, and working at different pressures.—*Comptes Rendus.*

METHOD FOR DETERMINING THE OHM.—By M. J. Joubert.—Suppose, on the one part, a circuit traversed by a current, the intensity of which is measured in absolute value by a tangent-galvanometer; on the other part, a wire not closed upon itself, submitted to induction and presenting at its extremities an electromotive force, variable according to a sine of the time

$$e = \mathrm{A} \sin 2 \pi \frac{t}{\mathrm{T}},$$

and in conditions such that the constant A may be easily calculated (terrestrial induction of Weber, sinusoidal inductor of Weber and Kohlrausch, &c.); lastly, a dial-electrometer, in which the needle is permanently connected with one of the pairs of dials. We bring alternately in communication with the electrodes of the electrometer: 1st, two points, A and B, taken on the first circuit and separated by the resistance to be measured; 2nd, the two extremities of the induced wire. The deviation observed is proportional to the square of the difference of potential of the two points, A and B, in the first case, and to the square of the mean electromotive force (mean of the squares of the electromotive force) in the second. If, to simplify the reasoning, we suppose the deviations observed identical, we shall have with the current, calling E the difference of potential between the two points, A and B, I the intensity of the current, G the constant of the galvanometer, a the deviation of the needle, H the horizontal component of the terrestrial magnetism, and designating by k a constant dependent on the electrometer

$$\sqrt{d} = k\,\mathrm{E} = k\,\mathrm{I}\,\mathrm{R} = k\,\frac{\mathrm{H}}{\mathrm{G}} \tan a\,\mathrm{R}:$$

with the terrestrial inductor, calling S the surface comprised between the coils, and T the duration of the revolution of the dial

$$\sqrt{d} = k \frac{\pi \sqrt{2}}{T} S H ;$$

with the sinusoidal inductor, representing by G_1 the constant of the coil, and by M the magnetic moment of the revolving magnet

$$\sqrt{d} = k \frac{\pi \sqrt{2}}{T} G_1 M.$$

The resistance, R, will be given according to the first arrangement by the equation

$$R = \frac{\pi \sqrt{2}}{T} \frac{S G.}{\tan a} ;$$

and with the second by

$$R = \frac{\pi \sqrt{2}}{T} \frac{G G_1}{\tan a} \frac{M}{H}$$

In the former case we have merely to observe T and a, and to calculate the two constants S and G; in the second the ratio $\frac{M}{H}$ must also be determined by the method of Gauss.—*Comptes Rendus.*

Graduated Vertical Galvanometer.—By Dr. Emil Boettcher.—Both medical and other practical interests render the use of graduated galvanometers necessary. Last summer the author obtained on trial a horizontal galvanometer from Gaiffe, of Paris, graduated in milliwebers, but did not like it. It is very inconvenient to read the degrees on the brass plate, and the tedious oscillation of the needle before coming to rest is very inconvenient. The subjacent brass plate does not at all answer its purpose as damper. When heavy vehicles pass along the street it is not possible to measure with the instrument even approximately. Dr. Boettcher had horizontal galvanometers constructed by Emil Stoehrer, jun., of Leipsic, in which the needle vibrates within a strong copper box, the upper plate of which is perforated for the emergence of the steel supporting point, and for introducing the rhombic needle. The aluminium index plays over a graduation upon white card paper. The damping is here excellent; the needle comes to rest almost immediately after the the current flows, which is a very valuable property.

For the measurement of both feeble and medium currents, up to 1 ampère, the copper box is covered with about 100 layers of thin copper wire for weak currents of 0·001 — 0·050 ampère, such as the physician, the telegraphic experimentalist and the physical investigator requires to measure; and with a short, thick wire for stronger currents of 0·01 — 1·1 ampère. This short wire surrounds the needle in the opposite direction. The positive electrode is always fixed in the same clamp, marked +, and the negative in the other. A convenient arrangement permits the current to be passed at pleasure either through the long or the short wire. This galvanometer is graduated in

$$\frac{\text{1 Daniell}}{\text{1000 Siemens' unit}} ,$$

understanding by Daniell pure, but not amalgamated, zinc in sulphate of zinc and copper in blue vitriol. A degree is consequently about 5 per cent. larger than 1 milliampère, and corresponds to 1-90ths of Jacobi's unit for the strength of currents. The figures of the graduation represent therefore directly the numbers of the units of the graduation.

Although in vertical galvanometers the needle only takes a perpendicular position when its plane of oscillation is vertical to the magnetic meridian, and in all other positions deviates in one or other direction from the plumb-line, yet one and the same current gives in all possible positions of the instrument exactly the same deviation if the galvanometer is inclined till the index comes against the zero-point. It is thus possible to graduate a vertical galvanometer correctly for all positions which may be found convenient in practice. The needle vibrates between copper damper plates, works easily, and yet soon comes to rest. The positive electrode is here always fixed in a clamp marked +; the current can be prevented either from passing through the galvanometer at all or turned through the short wire for strong currents, or through the long wire coiled in the opposite direction for feeble currents. The coils along with the graduated disc can be turned in both directions within the case.—*Zeitschrift Angew. Electricitätslehre.*

Synthesis of Various Organic Compounds by Means of the Electrolysis of Water, of Acid, Alkaline, and Alcoholic Solutions with Electrodes of Carbon.—By MM. A. Bartoli and G. Papasogli.—In certain researches on galvanic polarizations (*Atti della R. Accademia dei Lincei*, viii., p. 89) one of the writers has remarked that coke, wood-charcoal, or graphite is disintegrated under the action of the current, and whilst the electrolyte is coloured more or less black according to its nature and the kind of carbon used the volume of the gases given off at the positive pole is abnormally small. In order to ascertain what became of the oxygen, the authors undertook experiments with graphite from different sources, with coke and wood-charcoal purified with chlorine at high temperatures.

With wood-charcoal or coke as positive electrode, and with distilled water as electrolyte, they had to employ a powerful battery (1,200 Daniells) to overcome the resistance of the voltameter. After the current had passed for two days, the electrolyte was found to have taken a brown colouration and become slightly acid, and consequently conductive. The battery was then reduced to 100 Bunsen elements, and after ten days to 20 Bunsen's, which acted then for 30 days. At the end of this time the water was of a black colour; the charcoal electrode, which weighed about ½ kilo., was totally disintegrated, and there was a thick muddy deposit at the bottom of the voltameter. In the electrolyte was found mellitic acid and some of its derivatives, and in the sediment a new body, which the authors name mellogene. At the negative pole there was an abundant development of hydrogen, and at the positive pole a mixture of carbonic acid, carbonic oxide, and a little oxygen.

If graphite is used as a positive electrode in solutions of alkaline hydrates and carbonates, it is easily reduced to powder and the benzo-carbonic acids are found in the electrolyte. In acid electrolytes (sulphuric, nitric, &c.) graphite yields graphitic acid, which is found at the bottom of the voltameter mixed with powder of graphite.—*Comptes Rendus.*

NEW COMPANIES REGISTERED.

Electric "Sun" Lamp and Power Company (Limited).—Capital: £200,000, in £5 shares. Objects: To purchase the British patent rights of the "Lampe Soleil," and to carry on the usual business of an electric light and power company. Signatories (with one share each): J. W. Tricker, Croydon; C. W. Kirk, 148, St. Paul's Road, Camden Square; W. H. Jones, Barnes; E. W. Tilsley, South Wimbledon; H. Fleet, 7, St. John's Church Road, Hackney; E. Leworthy, Yatton Lodge, Herne Hill; H. D. Brooke, 57, Crowndale Road, Oakley Square. Directing qualification: £250 (nominal) in shares or stock. Remuneration: £1,200 per annum to the chairman, £600 per annum to the deputy-chairman, and £300 per annum to each other director; also 5 per cent. of the profits remaining after payment of 10 per cent. per annum dividend. Registered 26th June, by Ashurst, Morris and Crisp, 6, Old Jewry.

Anglo-Italian Brush Electric Light and Power Company (Limited).—Capital £400,000, in £5 shares. Objects: To enter into and carry out an agreement with the Electrical Association (Limited). Signatories (with one share each): T. B. Mackie, Upper Bedford Place; W. W. Fletcher, 14, South Villas, Camben Square; H. P. Gordon, Hatton Court, E.C.; F. A. Ford, 184, St. Paul's Road, Highbury; W. Koch, 21, Clarge's Street; S. May, 67, Russell Square; C. Boby, 55, Linton Street, N. Directing qualification: £150 in shares or stock. The first directors are Sir J. Lacaita, the Hon. A. Ponsonby, the Hon. F. Greville, and A. A. Buchanan. Remuneration: £1,200 per annum. Registered 27th June, by Harries, Wilkinson and Raikes, 24, Coleman Street.

NEW PATENTS—1882.

2943. "Improvements in primary and secondary galvanic batteries and cells and in materials therefor." H. ARON. Dated June 21.

2945. "Plates for secondary or storage batteries." C. SORLEY. Dated June 21.

2954. "Means or apparatus for measuring electric currents." C. A. CARUS-WILSON. Dated June 21.

2962. "Incandescent electric light lamps." M. VOLK. Dated June 22.

2974. "Production of the electric light." O. G. PRITCHARD. Dated June 22.

2990. "Generating, controlling, and utilising electric currents. (Communicated by La Compagnie Electrique.) J. H. JOHNSON. Dated June 23.

2992. "Improvements in apparatus for regulating the action of electric arc lamps, which improvements are partly applicable for other purposes." W. R. LAKE. (Communicated by J. M. A. Gérard-Lescuyer.) Dated June 23.

3002. "Dynamo-electric machines." P. JENSEN. (Communicated by D. A. Schuyler and F. G. Waterhouse.) Dated June 24.

3003. "Improved construction of telephonic or sound conducting wires for submarine and long distance purposes, also in compounds for insulating same and in transmitter and receiver diaphragms to be used in connection therewith." A. WILKINSON. Dated June 24.

3007. "Machinery for the regulation of speed in machinery driven by electricity and apparatus connected therewith." F. JENKIN. Dated June 24.

3008. "Telephonic instruments." J. D. HUSBANDS. Dated June 24.

3010. Improvements in electric lamps with incandescent conductors and in the manufacture of the same." W. E. DEBENHAM. Dated June 26.

3019. "An improved electric sock for boots and shoes." F. W. WOODMAN and T. W. AYLESBURY. Dated June 26.

3025. "Improvements in dynamo-electric machines, mechanism for securing uniformity and controlling the currents, and electric lamps." E. A. SPERRY. Dated June 27. (*Complete.*)

3033. "Production of carbons for incandescent electrical illumination." F. S. ISAAC. (Communicated by Sir J. Vogel.) Dated June 27.

3036. "Dynamo-electric machines." W. E. AYRTON and J. PERRY. Dated June 27.

ABSTRACTS OF PUBLISHED SPECIFICATIONS, 1881.

4948. "Electric lamps." G. G. ANDRÉ. Dated November 11. 1s. According to this invention the inventor applies a positive feed to the positive carbon of an arc lamp by means of a separate or independent current, and so that the said feed is only applied when there is any need for it, but then acting automatically. For this purpose he uses a shunt circuit or an independent circuit in connection with feed magnets and feed controlling magnets, which latter admit or refuse the entry of a very small current from the said shunt or independent circuit to the said feed magnets, all according as the arc requires adjusting or not, the said feed current passing through a relatively small independent wire which may be common to a great number of lamps, and the said feed current being regularly or intermittently supplied from the source of electricity by some suitable constantly revolving contact maker and breaker. The feed controlling magnets are wound with many fine coils offering a great resistance, so that if a short circuit is used only a very small part of the lighting current passes through the same. The controlling mechanism acting with the controlling magnets may be in the form of a gate-shaped armature turning between the poles of the magnet and in connection with a weighted lever and suitable contacts. The action of the lamp is as follows:—Referring to figs. 1 and 2. When the lamp current is turned on the armature, E, is attracted, the outer end of lever, E^3, is pulled down whilst its opposite end is raised, thereby canting the ring, E^5, and gripping and raising the holder, F, for the negative carbon, F^1, and thus establishing the arc. As the arc lengthens the resistance in the main circuit is increased, and the shunt current through the feed controlling magnet, C, becomes greater, thereby causing the armature, C^2, to be attracted, raising the weight, *c*, and breaking contact with C^1; when the feed current is sent through the cable, I, and the contact between C^5 and C^1 exists, the current will enter the bracket, L^3, passing through the lever, C^5, enter the carriage, C^4, passing thence out by the binding screw, L^2, to the terminal, K^2. If the contact between C^5 and C^1 is broken the feed current, instead of passing to the carriage, C^4, through the lever, C^5, will pass to the carriage by another route, *viz.*, by the coils of the feed magnet, B^2. The armature, B^1, will now be attracted, thus producing the feed by the action of the pawl, B^3, pawl wheel, A^3, pinion, A^2, and the rack on the carbon holder, A. The cessation of the feed current (which current acts only during a moment of time) releases the armature, B^1, which by its spring, B^4, is returned to its former position. The shortening of the arc by this feed action weakens the current in the feed controlling magnet, C, and the weight, *c*, restores the contact between lever, C^5, and contact, C^2. Thus, however often the intermittent feed current arrives at the bracket, L^3, a feed will only be produced when the contact between C^5 and C^2 is broken, that is, when the armature, C^2, is attracted in consequence of the lengthening of the arc.

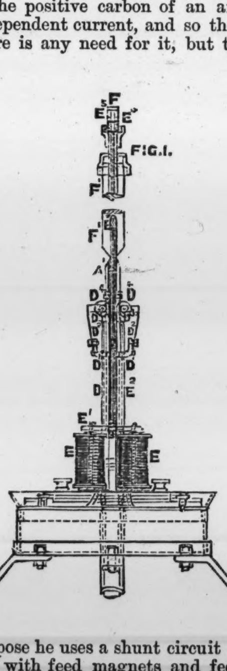


FIG. 1.

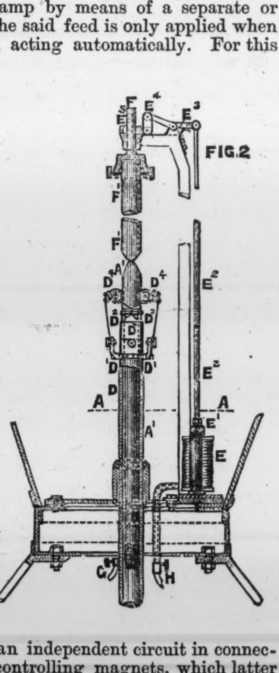


FIG. 2

5057. "Manufacture of galvano-nickel-plated sheet iron, &c." W. MORGAN-BROWN. (A communication from abroad by Ehregott Schroeder, of Leipsic, Saxony.) Dated November 18. 2d. The new process admits of the application of the cheaper metals, as iron, zinc, or tin, for nickel-plating in the most simple manner. The inventor cleans the sheet iron, sheet zinc, or tin plate by dipping in acids, grinding and polishing, and then galvanises them directly with nickel of one-tenth millimetre thickness without having deposited before the ordinary covering of copper. The sheets are then passed between the rollers of a rolling mill to equalise the thickness and to give the sheet a beautiful polish.

5070. "Telephonic repeater." C. MOSELEY. Dated November 19. 6d. Has for its object the repetition in an open or earth return circuit of the undulatory electric or telephonic current of a closed or metallic circuit, or the reverse, that is to say, the repetition in a closed circuit of the similar current in an open circuit in such a manner that the advantages of the closed circuit may be maintained. In carrying out this invention one or more induction coils are employed. If one coil only is used the two ends of the metallic line are connected with the two ends of one of the helices of the coil, so that the helix forms part of the closed circuit, the ends of the other helix being connected respectively to earth and to a single line wire. If more than one induction coil are used they may be joined up and connected with the two circuits and with earth; thus, in the case of two coils, the connections may be as follow:—From one wire of the metallic circuit to the primary of the first coil, thence to the secondary of the second coil, and from thence to the other wire of the metallic circuit; also from the line wire of the single wire circuit to the primary of the second coil, thence to the secondary of the first coil, and from thence to earth. In this manner the electrical condition of one circuit is induced in the other circuit, and the undulatory electric or telephonic current set up or existing in one circuit is therefore repeated in the other circuit.

5104. "Electric batteries." A. M. CLARK. (A communication from abroad by George Fournier, of Paris). Dated November 22. 4d. Consists essentially in the employment of metallic oxides capable of forming with glycerine or glyceric acid a solid compound insoluble in water, and the use of this compound for the manufacture of primary and secondary batteries. Of all the metallic oxides oxide of lead is the best adapted for the purposes of this invention. The following is the method of operation:—"The inventor takes oxide of lead in powder and mixes it with glycerine in sufficient quantity to form a thick paste sufficiently fluid to be run into moulds of suitable form. In about twenty-four hours after being thus cast the mass becomes solid and insoluble in water. This compound is very readily reducible, so much so that by placing it in a bath of dilute sulphuric acid in connection by a conducting wire with metallic zinc, it becomes reduced as fast as it is attached by the zinc to metallic lead. It is, therefore, eminently suited for the manufacture of galvanic batteries in which it would form the depolarising electrode, whether employed wholly in lieu of carbon or whether applied in layers upon carbon or other conductor of electricity. It is an excellent depolarising agent, which permits of forming constant single fluid batteries. As above mentioned, the compound after having served as the depolarising electrode becomes completely reduced. Thus, in the example, we have metallic lead as the product of this reduction, which being in a complete state of division is eminently adapted to recombine with oxygen in order to serve again as a depolarising agent, or even to become peroxidised, and may therefore be employed with advantage in the manufacture of secondary batteries.

CITY NOTES.

OLD BROAD STREET.

THE FAURE ELECTRIC ACCUMULATOR COMPANY, LIMITED.

AN extraordinary general meeting of the above company was held on Thursday afternoon, at Cannon Street Hotel, Sir Arthur Otway, Bart, M.P., presiding.

The notice convening the meeting having been read by the Secretary, Mr. H. Canning,

The Chairman said: Gentlemen, you have heard the terms of the notice which the secretary has just read. We felt it our duty to ask you to meet us to-day, for the purpose of carrying out the intentions intimated in that notice, of receiving a statement from the board of directors, and considering the future policy and business of the company, under circumstances which will be explained to the meeting, and if deemed expedient, to present resolutions in connection therewith. We felt it our duty, because although by the articles of our association, this board has undoubtedly the right and power to conclude any arrangement that it thinks beneficial for this company, still, the purposes which will be made known to you are of a character so important that we thought it due to the shareholders, and due to that consideration which men of business should always give to the wishes of their proprietary, to take their opinion before coming to any definitive conclusion on the matter which will be brought under your notice. Now, gentlemen, I shall ask you in considering the propositions which will be made known to you, and upon which you will be asked to give an opinion, I shall urge on you the necessity of considering the circumstances under which these propositions are laid before you. I shall, before making those propositions known to you, relate briefly those circumstances, and you will then see the importance of the suggestion which I have now made. I do not know whether there are many or any proprietors present to-day who were with us on the occasion when we last met; that was our statutory meeting. If so, they will remember that I indicated the policy which the Board intended to pursue with regard to the affairs of which we are the administrators. That policy met generally with the approbation of those present. It is unnecessary to repeat what took place, but I will remind you that among the observations made there was one somewhat partaking of the nature of a reproach that we had not disposed of our capital; and one gentleman went so far as to say that he thought we had commenced our business with insufficient capital. Well, gentlemen, I did not admit at the time the justice of that reproach, whether it was well founded or not. But scarcely had I left the room when I found that a gentleman had secured for himself the whole of the remainder of our capital. This was almost simultaneously with another circumstance, not less striking, not less interesting, and hardly less surprising. You are aware that when we last met we had an antagonist, a rival maker of accumulators, a powerful company entering on the business of rivalry with ourselves, and professing to have a better article than we had with which to conjure the public. We never, I need scarcely say, admitted that; we knew that this rival accumulator could only be brought into public use—we were so assured—by violating the rights which we possessed in our patents, and in order to protect those rights we had instituted proceedings against the company so offending. Well, then, I say it was with no little surprise that the company in supposed possession of an accumulator which was entirely to destroy the Faure, had become suddenly so convinced of the extraordinary merits of the accumulator of Faure that it had purchased the patents of the Faure accumulator company for the rest of the world. We therefore found ourselves in this strange position, that those who were our antagonists a day before had now become more interested in the success and establishment of Faure than we are ourselves, because whereas we owned them only for the United Kingdom, they owned them for the rest of the world. That surprised me, but I was not at all surprised under such a state of things that overtures should soon be made to us—a step which every rational man would take—to come to some understanding with the company so situated which I have described. The vendor of these Faure patents for all the world, with the exception of the United Kingdom, being a gentleman of great ability and considerable financial experience, had very wisely made a condition with the Storage Company, to whom he had parted with them, that they should agree to a basis of understanding with the company in which he had such a large stake. These conditions were made known to us, and although we were well aware that we had an uphill struggle if we commenced one with the master of many legions, still it would have been our duty to contend wherever we thought the rights of any of our shareholders had been infringed, or where their interests had not been duly consulted. These conditions, as at first offered to us, did not seem acceptable to us. After long and exceedingly difficult negotiations—I have been engaged in matters of this kind in various ways; but I do not hesitate to say that these negotiations, in which I have been engaged, have been amongst the most difficult I have ever conducted in my life—after long and difficult negotiations, carried on in the largest possible spirit, not a haggling and huxtering spirit, but influenced by the great interests involved in these matters, and, above all, the establishment of peace, instead of wasting our money in litigation, and our time and energies in unnecessary litigation, and establishing a union and thus forming two most powerful bodies, blending two powerful bodies into one, and that one having no opponent in the world. Influenced by that spirit, we were enabled to obtain some very valuable concessions, to which we thought we were fully entitled. They were wise enough to make these concessions to our just demands; and I am bound here to recognise the large spirit with which Sir Daniel Cooper and other gentlemen of the Storage Company met us. I must take the opportunity of acknowledging the assistance we have obtained during these negotiations from Monsieur Philippart, the vendor of the Faure patents to the Storage Company, and a very large proprietor in the interests of this company. I am glad to say that an agreement has been come to, if it is sanctioned by you—but only in that case—an agreement has been come to substantially between the two companies. I shall ask Mr. Wiseman to make known to you the heads of the agreement. What I shall say to you is to ask you again to recollect that which I told you just now of the circumstances under which the negotiations were carried on and the position of this large proprietary. My opinion is that you will say that the arrangement is one singularly favourable to the interests of the Faure Company. What I don't hesitate to say is that if an arrangement of that kind has to be made between two companies I could hardly conceive that any one should be concluded of a nature more favourable to ourselves. What has been done is this: we have come to an arrangement of peace, I may say, first of all. Perpetual peace I hope it will be between the two companies. I may say almost an alliance offensive and defensive, and we have drawn in a clear and definite way what the attributions of each company are to be with regard to the manufacture and use of the Faure accumulator. We have succeeded in preserving for ourselves, in my opinion, so far as I am able to form one, the most valuable portion of the accumulator business. We have preserved for ourselves nearly everything connected with railways, either by propelling or for lighting their stations, their carriages, their tunnels, their cafés, their restaurants, everything, in short, connected with them. We have preserved for ourselves everything connected with ships: their lighting, their propulsion, if necessary, whether on the seas, whether on canals, whether on rivers; in short, wherever ships are sailing under the English flag. We have preserved for ourselves the motive power of electricity, applied to tram cars and vehicles of all descriptions, bicycles, tricycles; and last, but by no means least, we have secured for ourselves the uses of the accumulator for machinery for all purposes. The Storage Company have received from us the exclusive use of the Faure accumulator in the United Kingdom of Great Britain. They possessed it, of course, for all the rest of the world already for the lighting of houses and towns. In case there should be any omission of details in what I make known to you, Mr. Wiseman will correct me, as he has a *précis* of the agreement. I am speaking from knowledge which I have been obliged to carry in my head for a long time. Well, gentlemen, there are other conditions, and one a very important one, namely, that in order to establish a community of interest between the two companies, we have mutually had an interchange in the ratio of the value of our shares. We share in their patents over the entire world, and we give them for the United Kingdom a portion very favourable to ourselves. The Storage Company give to us 6,000 of their shares, and we give to them 20,000 of ours in a further emission of shares to be created for the purpose. There are some subsidiary arrangements that are entirely favourable to ourselves—they must be favourable for the simple reason that they are entirely of an optional character, and anything optional cannot be unfavourable. We have the right of sharing up to a certain time in the formation of branches connected with the Faure and the Storage, and in addition the Storage Company give us a proportionate share of all the profits made from the beginning of their company up to the present day, if that agreement is approved—(hear, hear)—and, as you are aware, these are not slight. I have given the heads of the agreement, and I never like to detain shareholders long. The best plan I find is to make my statement, and ask any gentleman to whom I have not made myself sufficiently clear to question me on any point, and let me answer to anything that he wishes to know. I therefore will now conclude this statement by asking you merely to recollect my opening observations, because there are circumstances that, as men of business, you must take into account when giving a decision. A gentleman, out of a capital of 40,000 shares, now owns 28,602, and he is making himself every day a larger and larger proprietor in this company. We know what that means. I consider it myself a fortunate circumstance that if there is to be anything of this kind in connection with our company, it is on such a very large scale that it is impossible to have any doubt as to where such a proprietor's interest must lie. That, of course, is a statement that will weigh with you greatly when coming to any decision on the future of the company. A man who owns three-fourths or two-thirds of the shares of a company will after a certain lapse of time be in a position to carry any proposal in regard to it that he approves of, or defeating any of which he disapproves. I feel, however, gentlemen, bound to say that no consideration whatever would induce me to place before the shareholders of a company any sets of conditions or proposals without giving my own opinion upon them. I think this is what every body of shareholders has a right to expect from their chairman (hear, hear). I say therefore under the circumstances of the case, that I am rather surprised that we should have been able to obtain conditions so favourable to ourselves as these are. Of course, a great deal will depend on the working out. This, perhaps, is a question still to be determined, but I have no hesitation in telling you that we should consider it our duty to carry out this agreement, unless there was a very strong opinion on the part of the shareholders that it was an agreement disadvantageous to themselves. If the shareholders were to express a strong opinion of that kind, then I think we should, as practical men, be bound to consider such an expression of opinion with the respect which it deserves; but I cannot think that you will come to any such conclusion. You have heard the conditions, and I shall now ask you if you—any of you—want to know anything further to inquire of me; and then I hope that some one of you in the room will be so kind as to move some resolution giving expression on the part of the body of the shareholders to the conditions of the proposal in the general scheme which has been laid before you. At the present moment, I should mention merely that the agreement is not signed, and, indeed, not actually drawn out in proper form; but I think I have given you the general spirit of the agreement and correctly stated all the particulars that are essential to its meaning.

Mr. Wiseman then read the heads of the agreement between the Faure Accumulator Company and the Storage Company, which were essentially the same as those which the chairman had embodied in his speech.

The Chairman then said: I am very desirous of saying, that if any shareholder wishes further information on this subject, I shall be happy to give it so far as lies in my power.

Mr. Henry Clarke said it appeared to him that they were giving the said company licence to use their patents with certain exceptions, and also 20,000 of their shares, but it did not appear to him so far that they were getting a *quid pro quo*. They did not allow for a moment that the Storage Company had no patent which was at all to be compared with their own. He thought it was a question whether the 6,000 shares they were receiving were a *quid* for the licence they were receiving from them, and for the 20,000 shares in addition.

The Chairman: I was very much of your opinion for some time; but circumstances brought me to a different opinion, and the circumstances are these. You must first of all let me correct a trifling error on your part. What we are receiving from the Storage Company is not absolutely without value. I cannot admit that their accumulator can compare for one moment with the Faure, and I think the best proof of that is given in the action they have taken; but it is not absolutely without value. Their patents have some advantages, and these we have now the use of. With regard to the *quid pro quo*, we get 6,000 shares and give 20,000. In the monetary value that would be very much in favour of the 6,000, because they were much more valuable than the 20,000 shares when this agreement was talked about. But we have also this, that we share in proportion to the Storage Company's capital which we possess in the profits of the Faure patents all over the world; and great and powerful as Great Britain is, I do not think these islands can compare in extent with the rest of the world.

Mr. Clarke: For how many years?

The Chairman: As long as the duration of the patent there is no question of these conditions being altered if you agree to them. I may say that the gentlemen on the other side, after going into calculations, came to be of an opinion that they were giving too much value to us under the circumstances. I have had great correspondence on this subject; and many shareholders are under the very erroneous impression that all the bargaining has been as to the acquisition of the Sellon and Volckmar patent. We have only been endeavouring, however, to obtain our own property, that is, the use of the Faure accumulator in every part of the world, although the Sellon and Volckmar is not altogether without value.

Mr. Dickson asked if it was only British vessels that they had obtained the privilege of lighting.

The Chairman said they had the exclusive right with regard to British vessels, and as these were more numerous than all the others put together, they got the most valuable part of the lighting of the world's vessels. A very difficult question had arisen on this matter, which it might be interesting for the shareholders to know—in fact, they had not yet succeeded in solving the difficulty—that was as to the position which British vessels, lighted by the Faure accumulator, would occupy in entering into French ports, where they came under action of the French patents. He had no doubt that in time the difficulty would be entirely got rid of, because it stood to reason that such an absurdity should be abolished as that an English vessel, lighted with the Faure accumulator, sailing, say, from Newhaven and entering in at Dieppe, should suddenly be put into utter darkness, and it would be much more ridiculous if propulsion by electricity came into play.

Mr. Dickson asked if it was only in regard to French vessels that this difficulty arose.

The Chairman said it referred to all vessels other than British.

Mr. Edgar Green begged to propose that the arrangement as shadowed forth, since it was such a satisfactory and advantageous one, should be adopted.

Mr. Morris, in seconding the motion, said that the shareholders ought to recognise the energy of the board in carrying out such an extraordinarily good bargain for this company. He considered the present price of the shares was quite nominal, and nothing to what it would be if the directors' plans were carried out.

The Chairman then put the resolution to the meeting, and, in doing so, remarked that he had foreborne to allude to the position of the shares in the market. He always thought it best to deal with these matters on their merits; but, of course, that was a very important factor, and it showed how they stood with the public.

The resolution was then put and carried unanimously.

The Chairman, in answer to a shareholder, said that the Storage Company had the exclusive right to the lighting of all towns and houses, except houses and buildings connected with railways, to which the Faure Company had exclusive right. The idea of the agreement was that the application of motive power and railway lighting should belong to the Faure, and that general lighting should belong to the Storage Company. He thought the arrangement was exceedingly well drawn, with great simplicity, and that there was not likely to be much clashing between themselves and other interests. The Faure avoided entering into competition under that agreement. For instance, they would have no competition with gas. They were opening a new field. He thought that the greatest value of the arrangement to them would be with regard to propulsion. He had been present at a very interesting lecture, by one of their engineers, lately, and that lecture had brought him to the conclusion, whether fairly or not he could not say, that we were not very far off the time when electricity would be largely used for purposes of propulsion; and they must remember that under the agreement all electric arrangements for propulsion belonged to them.

In reply to a further question,

The Chairman said that the total number of shares in the Storage Company was 80,000 nominal, and 60,000 subscribed, of which the Faure Company thus possessed 1-10th. He intended to add that on the last occasion on which they met they had secured the lighting of a theatre, and some gentlemen seemed to be a little angry at the idea that they had got a theatre. They had at present an agreement concluded with the Criterion for its lighting, and if any gentleman liked to look into the grand dining-room of that place that evening, he would see the hotel lighted by their accumulator. They had also made arrangements, not at all of an unsatisfactory character, with regard to the operation of the Faure accumulator in Ireland. If they could give them no other benefit they would give them a little electric light in Ulster. The 6,000 Storage shares he further explained were to be allotted to the Faure Company in the name of the Faure Company, and not to any trustee for them.

Mr. Gibson asked what were the obligations of the two companies as to resisting any future infringement of their patents.

The Chairman said he thought he had mentioned that they had a treaty offensive and defensive, by which each company was bound to defend its own interest if its patents were infringed in England. Each could call on the other immediately any infringement was made on the patent.

Mr. Perring asked how the 20,000 shares were to be provided for the Storage Company.

The Chairman replied that the capital of the Faure Company was £1,000,000, of which they had called up only £40,000, and this 20,000 were to be a new emission. The 40,000 were all taken up.

Mr. Bowten said they were not taken up at the time of the last meeting.

The Chairman said they were not, but they were immediately afterwards. Monsieur Philippart had taken them all and secured the whole. He did not know whether he had got the whole, but he was pretty certain that either he or his friends owned them. They were taken up and paid for.

On the motion of Mr. Henry Green, seconded by Mr. Booth Scott, a hearty vote of thanks to the Chairman for his conduct in the chair was unanimously carried, to which the Chairman briefly responded, and the meeting separated.

ELECTRIC LIGHT AND POWER GENERATOR COMPANY.

ON the 27th ult. the annual meeting of the shareholders of this company was held at the Cannon Street Hotel. Admiral Sir E. A. Inglefield, C.B., F.R.S. (chairman), presided, and there were present: Mr. J. S. Campbell, Mr. G. Inverarity, Sir H. B. Sandford, Mr. H. Watt (directors), Mr. W. H. Massey (general manager), Mr. W. Crookes, F.R.S. (consulting engineer), Mr. F. H. Landon (secretary), and a large number of shareholders.

The report stated that the total sum expended for patents amounted to £100,208; that the value of stock and premises was £29,069; that the amount spent on contracts and experimental work and in improving the lamps was £9,806; and that the total expenditure for salaries, fees, and all other expenses had been the comparatively small sum of £6,674. Since the statutory meeting of the 5th July, 1881, the directors have purchased the Weston and Maxim systems of electric lighting. Each of these systems the directors believe to be second to none. In connection with any system of electric lighting, an incandescent lamp, for limited areas and domestic purposes, is indispensable. The Maxim incandescent lamp has proved, under experience, all that the directors anticipated from it in beauty, durability, and economy; while the Weston dynamo machines and arc lamp, which were required to form a portion of the whole purchase under which only the Maxim patents for dynamo machines and lamps could be secured, have, after thorough and practical tests, been proved to be equally satisfactory. The endeavours of the directors, during the season under review, have been successfully applied to the dissemination of a knowledge throughout the country of the above-mentioned systems. The operations of the company have extended to the following places:—London, Windsor, Edinburgh, Glasgow, Liverpool, Derby, Coventry, Norwich, Wigan, Cardiff, Dartford, Bishop Auckland, and Risca Colliery, and the lights have been exhibited at the Crystal Palace. The Maxim lamps have also been introduced into Her Majesty's Navy, and were further most successfully shown in the quadrangle of Windsor Castle, on the occasion of the recent royal marriage. The directors believe that their proceedings in the foregoing respects will result in further remunerative contracts to the company on a large scale as well as in future custom for its manufactures. Recent favourable contracts have been made with the Railway and Electric Appliances Company, Limited, and with the Jablochkoff Electric Light and Power Company, Limited. A second contract has also been made with the Commissioners of Sewers for the City of London, and other minor contracts of less importance. This company having commenced with a moderate capital, and without the possession at first starting of a going concern, everything in connection with its business had necessarily to be initiative and experimental, for which time and outlay were both indispensable. A dividend for the first twelve months could not, therefore, have been anticipated. Altogether the directors believe the company to possess a valuable property; its capacities have been practically and thoroughly tested, of which both the shareholders and the public have had ample opportunities of satisfying themselves. Since the formation of the company the following directors have resigned:—Mr. J. G. Jebb, Managing Director, Mr. J. D. Pender, and Mr. M. Low. The board were so fortunate as to secure the services of Mr. W. H. Massey, as

General Manager, in the place of Mr. Jebb, and have found that gentleman a very great acquisition. Mr. George Inverarity, a gentleman of great experience and business capacity, has joined the Board in succession to Mr. Low, and Mr. Hugh Watt, merchant, in place of Mr. Pender. Mr. Watt's commercial experience is also expected to be most valuable. In accordance with the Articles of Association, two directors, Sir Edward Inglefield, and Sir Herbert Sandford, retire, and offer themselves for re-election.

The Chairman gave a short history of the company. It was possible, he said, for a patent to be a good one and to be well worked without its being immediately remunerative to its possessor. It was his duty to prove that the validity and excellence of their patents were exceedingly good, and that the directors had done their utmost to make them remunerative. At the time that the company took over the concession that had been given to them by the City authorities for the lighting of a portion of the City, they had only the Lontin light. They undertook to produce the lights by May, 1881, an interval of only a month. They commenced literally without staff, workshops, tools, or anything necessary. Great difficulty was experienced in getting a site for their workshops, but they had eventually been offered favourable premises near Southwark Bridge, which they had accepted. After detailing the difficulties experienced in starting the light, the chairman continued that at this point the directors were offered the incandescent lamp, now well known as the Maxim light. The result of their experience was the decision that this light was superior to theirs, and their consulting electrician, Mr. W. Crookes, F.R.S., advised them not to lose the chance of obtaining it. The price asked was very large, £100,000, but the directors succeeded in reducing this to £54,000, of which £22,000 was to be paid in shares, and £32,000 in cash. Part of the agreement was that the company should also purchase the Weston arc light, with a number of patents with it, which of course was done. That they might lose no time the directors immediately made arrangements for having lamps and apparatus sent from America. The Weston light was found to work better in the City in the streets relegated to the company, viz., Queen Victoria Street, Queen Street, Queen Street Place, and Southwark Bridge. All of these places were worked from below Southwark Bridge, but the light during the season of long nights was found to require the carbons to be renewed after eight hours' burning. This operation was found to be dangerous to the workmen whilst the current was passing through the wires, and the directors had decided to stop the light temporarily rather than risk an accident. This difficulty, however, had been obviated by the use of double arc lamps, some of which they made and others they imported. By this means they had been able to complete the City contract, and he believed all would agree the result was successful. (Applause.) The chairman went on to describe the concessions the company had granted to other companies, from which a profit of £60,000 was in a short time expected. Their company was the fifth in the field out of the fifty-four advertised.

Sir Herbert Sandford seconded the adoption of the report.

Mr. W. CROOKES, F.R.S., explained the position in which he stood as electrician to the company, and the circumstances under which he had sold his shares and become a director of another company. He said he was pleased at the favourable position of the company, which might induce him to re-purchase shares. He was quite willing to resign his position, but he was bound to the company by a two years' engagement.

The Chairman said he was pleased that Mr. Crookes had resigned with grace, as the directors had felt reluctant to ask him so to do.

The report was then adopted. The retiring directors, Sir E. Inglefield and Sir H. Sandford re-elected, and the auditor, Mr. H. Dever, re-elected.

An extraordinary meeting next took place for the purpose of changing the name of the company to "The Maxim-Weston Electric Company (Limited)." In proposing this, the Chairman (Sir E. Inglefield) said their company having been one of the first started, the name was then sufficiently distinctive. Since that time, however, twenty-three electric companies had adopted the words "Light and Power," and one called itself the Electric Light and Power Generating Company, which was only one syllable different to theirs. The alteration proposed would at once show the valuable properties which the company possessed. The resolution was carried unanimously, and the meeting terminated with a vote of thanks to the chairman.

EASTERN TELEGRAPH COMPANY.—An Imperial Firman has just been granted to this company, according them the right to establish a submarine telegraph cable from Tripoli, Africa, to Malta.

THE EASTERN AND SOUTH AFRICAN TELEGRAPH COMPANY.—This company state that the coupons due to-day on their Five per Cent. Mortgage Debentures will be paid, on presentation, by Messrs. Barclay, Bevan, and Co. Coupons must be left three clear days for examination.

WEST COAST OF AMERICA TELEGRAPH COMPANY, LIMITED.—The coupons due June 30th on the Debentures of this Company will now be paid at the offices of the company, 98, Cannon Street, London. The coupons must be presented for examination three days before payment.

BRUSH MIDLAND ELECTRIC LIGHT AND POWER COMPANY, LIMITED.—We are asked to announce that the directors of this company have decided not to make the call of £1 per share fixed for to-day, as sufficient capital is in hand for present requirements.

THE METROPOLITAN (BRUSH) ELECTRIC LIGHT AND POWER COMPANY.—This company notify that they now possess stations in Holborn and Westminster, and are about making a vigorous start. They also state that numerous applications are being received for their system of lighting, and that they intend opening as rapidly as possible stations throughout the whole of the metropolitan postal districts.

THE Stock Exchange Committee appointed the following special settling days in the securities enumerated:—Thursday, 29th ult., Great Western Electric Light and Power Company, Limited, shares; Indian and Oriental Electrical Storage and Works Company, Limited, shares. The above to be marked. South-Eastern Brush Electric Light and Power Company, Limited, shares; Brush Electric Light and Power Company of Scotland, Limited, shares. Quotation deferred.

APPLICATION has been made to the Committee of the Stock Exchange to appoint a special settling day in the following securities:—Faure Electric Accumulator Company, Limited, shares; Provincial Brush Electric Light and Power Company, Limited, shares; Australasian Electric Light, Power, and Storage Company, Limited, shares; application being made for a quotation also in the last-mentioned security.

LATEST QUOTATIONS.

Authorised Issue.	Share.	Name.	Paid.	Closing Quotations. June 28.	Business Done.
		ELECTRIC LIGHT.			
40,000	10	Anglo-American Brush Co.	4	26½- 27½	26¾.⅝.7 ac.
		Do. Do.	10	47 -52	48½m. 47⅝.8. 9½.7 ac
150,000	1	Electric Light and Power Generator Co.	1	¾- 1	⅞ ac.
25,000	5	Great Western Electric Light & Power Co.	2	1½- 2½	1½.¼ ac.
24,980	5	Hammond Electric Light & Power Supply Co.	2½	11½- 12½	11⅜m.* 12¼ac.
40,000	5	Indian & Oriental Electrical Storage Co.	2	2 - 2½	
		TELEGRAPHS.			
2,116,400l.	Stk.	Anglo-American, Limited	100	52 - 53	52¾ ac.
2,441,800l.	Stk.	Do. Preferred } Def'd. receiving no div. until 6 p. c. has been paid to Pref.	100	82 -83	82¼.2.3.2¾. ½ ac.
2,441,800l.	Stk.	Do. Deferred	100	22½- 23½	23 ac.
130,000	10	Brazilian Submarine, Limited	10	11½- 11¾	11½m.11$\frac{9}{16}$ac
16,000	10	Cuba, Limited	10	9¾- 10¼	
6,000	10	Do. 10 per cent. Preference	10	16 - 17	
13,000	10	Direct Spanish, Limited	9	6¼- 6¾	6½ m. 6½ ac.
6,000	10	Do. 10 per cent. Preference	10	15½ 16½	
65,000	20	Direct United States Cable, Limited, 1877	20	11¾- 12	
100,000l.	100	Do. 6 per cent. Debenture, repayable 1884	100	101 -104	
380,000	10	Eastern, Limited	10	9⅞- 10⅛	9⅞ ac.
70,000	10	Do. 6 per cent. Preference	10	13 - 13¼	
232,000l.	100	Do. 6 do. Debentures, repayable Oct. 1883	100	99 -102	
200,000l.	100	Do. 5 do. do. Aug. 1887	100	101 -104	
200,000l.	100	Do. 5 do. do. Aug. 1899	100	102 -107	
199,750	10	Eastern Extension, Australasia & China, Limited	10	11⅛- 11⅜	11$\frac{3}{16}$m.11¼ac
320,000	100	Do. 6 p. c. Debentures, repayable Feb. 1891	100	106 -110	
500,000	100	Do. 5 p. c. (Australian Gov. Subsidy) Deb. 1900	100	104 -107	
140,000	100	Do. do. registered, repayable 1900	100	104 -107	
100,000l.	100	Do. 5 per cent. Debenture, 1890	100	101 -104	
254,300l.	100	Eastern and South African Limited 5 per cent. Mort. Deb. Registered redeemable 1 Jan. 1900	100	104 -107	
345,700l.	100	Do. do. do. To Bearer	100	104 -107	
22,050	10	German Union Telegraph and Trust, Limited	10	9¾- 10¼	
163,390	10	Globe Telegraph and Trust, Limited	10	6¼- 6½	
163,209	10	Do. 6 per cent. Preference	10	12⅛- 12⅜	
125,000	10	Great Northern	10	12¾- 13¼	
100,000l.	100	Do. 5 per cent. Debentures	100	102 -105	
31,200	10	India-Rubber, Gutta-Percha and Telegraph Works	10	25½- 26½	
100,000	100	Do. 6 per cent. Debentures, 1886	100	101 -105	
17,000	25	Indo-European, Limited	25	28 - 29	29 ac.
38,148	10	London Platino-Brazilian, Limited	10	4½- 5	
12,000	10	Mediterranean Extension, Limited	10	2 - 2½	
8,200	10	Do. 8 per cent. Preference	10	8½- 9	
9,000	8	Reuter's, Limited	8	12¾- 13¼	
280,000	Stk.	Submarine	100	265 -275	
58,225	1	Do. Scrip	1	2⅜- 2⅝	
4,200	Cert.	Submarine Cables Trust	100	100 -105	
37,350	12	Telegraph Construction and Maintenance	12	29½- 30½	
150,000	100	Do. 6 per cent, Bonds, 1884	100	102 -105	
186,750	5	Do. 2nd Bonus Trust Cert.	5	1½- 1¾	
30,000	10	West Coast of America, Limited	10	4¾- 5¼	
150,000	100	Do. 8 per cent. Debentures	..	..	
69,910	20	Western and Brazilian, Limited	20	7 - 7½	
200,000l.	100	Do. 6 per cent. Debentures "A" 1910	100	107 -112	
2,500	100	Do. 6 p.c. Mort. Deb. series B of '80, red. Feb., 1910	100	99 -102	
1,500	$1,000	Western Union of U. S. 7 p.c. 1 Mort. (Building) Bds.	$1,000	121 -126	
1,030,000l.	100	Do. 6 per cent. Sterling Bonds	100	102 -105	
88,321	10	West India and Panama, Limited	10	1½- 1¾	
34,563	10	Do. 6 per cent. 1st Preference	10	8 - 8½	
4,669	10	Do. 6 do. 2nd do.	10	6½- 7	
		TELEPHONES.			
154,165	1	Con. Telephone & Maintenance, Ld. Nos. 1 to 154,165	1	1⅜- 1⅝	
200,000	1	Oriental Telephone Co., Nos. 100,000 to 300,000	½	⅜- ⅝	
100,000	5	United Telephone Co.	5	13 - 13½	13¼ ac.

* Exceptional amount at special price.

The last prices on June 28th of Electric Light Shares not officially quoted were as follows:—Australasian, ⅛ dis. to ⅛ prem.; Eastern Electric Lights, 4 to 4½; Metropolitan, 1 to ½ dis.; Midland, ¼ dis. to par; Pilsen-Joel, ¼ to ½ prem.; Scotch, 1 to ½ dis.; South Eastern, 1½ to 1 dis.

TRAFFIC RECEIPTS.

West Coast of America Telegraph Company, Limited. The gross earnings—traffic and steamer—for two months ending May 31st, 1882, were £6,100, against £5,050 for the corresponding period of last year, showing an increase of £1,050.

Western and Brazilian Telegraph Company, Limited. The traffic receipts for the week ending June 9th, 1882, were £2,180, after deducting the "fifth" of the gross receipts payable to the London Platino-Brazilian Telegraph Company, Limited.

West India and Panama Telegraph Company, Limited. The estimated traffic receipts of this company for the half-month ended the 15th June are £2,484, as compared with £2,713 in the corresponding period of 1881. The February receipts, estimated at £5,459, realised £5,632.

EDWARD PATERSON,
TELEGRAPH & ELECTRICAL ENGINEER,
St. Paul's Works—76, LITTLE BRITAIN, LONDON, E.C.,
AND
European Telegraph Works—POWNALL ROAD, DALSTON.
(PARIS AGENTS—E. & S. DELEVINGNE, 8, RUE MARTEL, PARIS.)
Prize Medal, International Electrical Exhibition, Paris, 1881.
MANUFACTURER OF
Telephones, Transmitters, Switchboards,
AND ALL ACCESSORIES FOR
TELEPHONE EXCHANGES.
Electric Signals for Mines, Houses, Ships, &c. Block and Needle Instruments for Railways.
Silk and Cotton covered Wires; Rubber covered Wires for Electric Signals; Electric Light Leads.
THE DOUBLE INDUCTION MOTOR FOR SEWING MACHINES, &c.
Batteries, Insulators, and other Telegraph Stores. Continuous Copper Band Lightning Conductors.

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Ammeter.

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Dynamometer Coupling.

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LOUD SPEAKING TELEPHONE.
As adopted by Her Majesty's Government.

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A Constant Battery for Mining and Blasting Purposes.

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GLASGOW ... ... 20, Dixon Street.
BRADFORD, YORKSHIRE ... ... 35, Kirkgate.
SHEFFIELD ... ... 10, Castle Street.
PORTSMOUTH ... ... 49, High Street.
BELFAST ... ... 33, High Street.
DUBLIN ... ... 15, St. Andrew Street.
BRISTOL ... ... 37, Corn Street.
NEWPORT, MON. ... ... 82, Dock Street.
CARDIFF ... Pierhead Chambers, Bute Docks.
NEWCASTLE-ON-TYNE ... 21, Grainger Street West.